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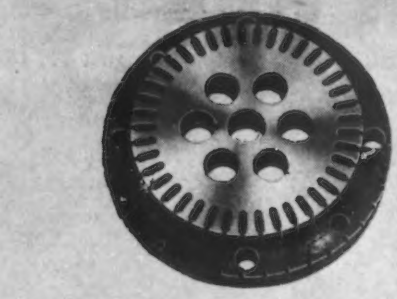

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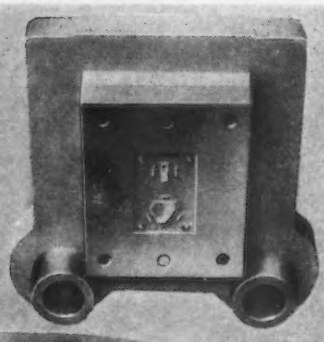

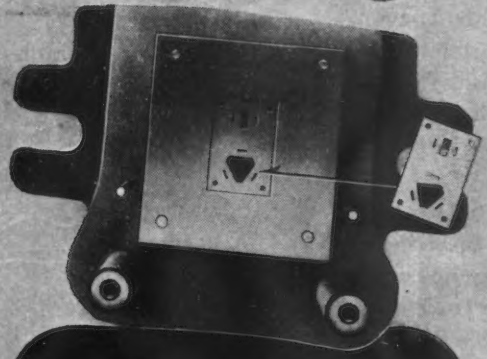

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August 31, 1944

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Uncle Sam and the Goat

A FRIEND of mine said the other day: "Funny, isn't it, that we seldom see a picture of Uncle Sam any more?"

I had not thought of that before but, coming to think of it, you do not often see the chin-whiskered visage of the smart old gentleman nowadays.

Up to a few years ago, you met him almost every day somewhere. During the first World War there was scarcely any issue of a newspaper or magazine that did not portray him prominently. He peered at you from thousands of billboards too, all over the country, asking you to buy Liberty Bonds.

"Liberty" Bonds. Today it's War Bonds. The word "liberty" and Uncle Sam as we knew him seem to have gone out of style together.

Old Uncle Sam was certainly a smart looking gentleman. You could tell by one look that nobody could fool him, at least for very long. You couldn't tell him that hair could be made to grow on a billiard ball or that you could lift yourself by your bootstraps. He would say: "That's mighty interesting, sonny, but you'll have to prove it before I recommend it to my nephews and nieces."

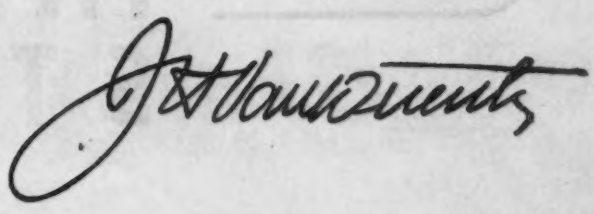
You could tell, too, by one look at Uncle Sam that he was a mighty good poker player whom you could back with your dollar or with your two bits, whichever you happened to have in your pants' pocket. Nobody could bluff him in a straight game and he knew enough about human nature not to sit in one at home or abroad where the opponents had a marked deck or extra aces.

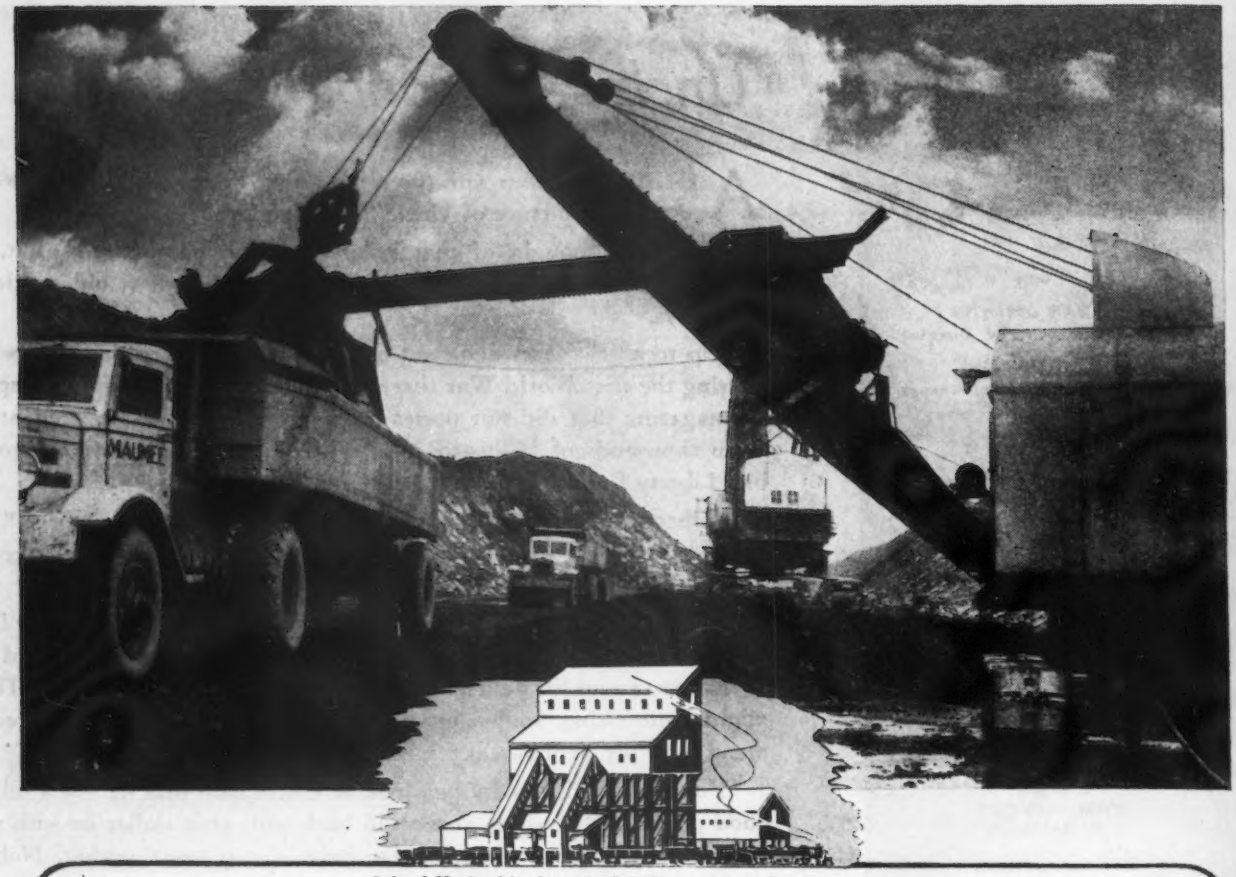
One look at Uncle Sam and you knew that he was a man of few words who meant what he said, did what he promised and was mighty careful not to promise more than he could perform. If he thought you were wrong, he would try to put you right in a kindly way; if you persisted in doing wrong, he would not call you names but would swing that number fourteen boot of his to where it would do the most good.

To us old-timers, Uncle Sam resembled the men who built this country and its industries and made it what it is. He had a keen eye and while he liked to look at the stars at night, he did not dream in the daytime. Daytimes he was busy working and making work for others. He knew that work came from the ground and not from the sky.

Our youngsters haven't had much chance to get acquainted with the real Uncle Sam. I am afraid some of them think of him as a composite picture of Santa Claus, a Hollywood pinup girl and a fat little guy with horn-rimmed glasses, a marcel wave and a degree in economics.

Too bad they have turned his picture to the wall. Maybe it's because of those chin whiskers. Too many people might get the idea that the "powers that be" were making a goat out of him!





Inland Hi-Steel buckets, truck bodies, screens, chutes, etc., are giving many times the service obtained from other steels.

COSTS TOPPLE AT A TIPPLE

Screens, Chutes and conveyors of Inland Hi-Steel Have Outlasted Mild Steel 12 times . . . *and Are Still Going Strong!*

The facts behind this story of lower costs began six years ago when Inland Hi-Steel replaced mild steel for buckets, truck bodies, chutes, screens, and conveyors in the tipple at Maumee Collieries.

The mine records indicate that mild steel failed every 5 to 6 months due to the abrasive action of the coal. The same records show that Inland Hi-Steel, with its high resistance to abrasion in this type of service, has been in use for over 6 years without a single replacement . . . *and that it is still going strong.*

After the first year, when the higher cost of Inland Hi-Steel was paid through savings, every ton of coal that traveled down the chutes, through the screens and over the conveyors was handled at less cost.

Inland Hi-Steel is not only abrasion and corrosion resistant, but its high-strength means weight saving as well. It is doing many important war and peace jobs where these favorable characteristics mean savings in time, labor and materials. Write for the Inland Hi-Steel Bulletin.

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INLAND STEEL

The IRON AGE
August 29, 1944

NEWS FRONT

► This week for the first time since April 10, 1941, there is a change in THE IRON AGE steel scrap composite price. General weakness of the scrap market has resulted in a lowering of heavy melting scrap prices, making the composite $18.84.

► Farmers are being advised by their influential trade magazines that the war's end is in sight, and that they should sell, sell, sell--get rid of everything from wheat to land. For, it is said, "inventory losses can wipe out profits from several years' hard work."

► A new bright-alloy electroplate, a ternary deposit of copper, tin and zinc, has been made available commercially by Hanson-Van Winkle-Munning Co., which is sole agent for marketing and servicing. The coating is bright as deposited, is non-magnetic in an electrical field and its reflectivity approaches that of silver.

And: This new coating has high tarnish resistance, superior corrosion protective value, is hard, abrasion resistant and is easily soldered with non-corrosive flux. It can be formed without chipping where the deposit does not exceed 0.0002 in. in thickness. Application is recommended particularly for copper and brass, but can be made on steel following an initial plating of copper.

► The British are employing their jet-propelled fighters for interception over England. Use is being made of them to knock down flying bombs.

► Allied pilots have reported four types of German jet-propelled fighters encountered in recent raids. Two Heinkel's, Nos. 280 and 219; and two Messerschmitt's, Nos. 163 and 262.

Allied espionage was particularly good in reporting details of these German jet fighters prior to their use. For months Allied pilots have been studying scale models of the planes, and this enabled them to recognize the revolutionary aircraft immediately.

► All these German planes are reported to be jet-propelled. However, the Messerschmitt 163 is not jet-propelled but is rocket-propelled. A liquid fuel is used, probably oxygen along with some other liquefied fuel, and the explosion is not continuous like a skyrocket but rather is short and in rapid bursts. The plane is phenomenal in the air, but has an operational time limit of 8 min.

This is the first airplane ever to fly by rocket power, and as such is years ahead of its time. All opinion is that the jet-propelled engines would reign for a 10-year or so transition period between conventionally powered aircraft and rocket aircraft.

► American jet-propelled aircraft will likely be used against the Japanese before the war's end. Whereas GE motors and the Bell twin-engine jet plane have received all the publicity, some guesses are that even more important developments are taking place elsewhere.

► The jet impulse motor on the German flying bomb is the most simple motor ever developed. It is the cheapest known method of delivering explosives at distances beyond artillery range.

The motor, an ordinary steel tube narrowed to a venturi at the rear, has a grid-work front end, each grid opening closed by a spring flap. Gasoline is continually sprayed by air pressure into the body of the tube and the firing plug is located near the venturi.

On leaving the launching ramp the rush of air forces the flaps open, air pressure builds up in the body of the tube, and when pressure and gasoline mixture builds up to a certain point the mixture fires. Recoil of the gases out the venturi acting against the flaps closes them, just like banging an ordinary door, and the assembly is driven forward.

One major mystery was the firing plug. Examination of many bombs showed no electrical distributor or make-and-break arrangement. It is now pretty well established that the firing plug is a wire which is always white hot and automatically fires the air-gas mixture as pressure and gasoline concentration builds up to flash point.

Recent Developments In Industrial Furnaces

. . . One of the most stimulating meetings of the semi-annual convention of the ASME held in Pittsburgh June 19 to 22 (for full report, see The IRON AGE, June 29) was the panel discussion on trends in furnace design. A complete summation of this forum is herein presented with emphasis on the fundamental concepts of heat transfer, energy balance, physical chemistry and materials of construction.

By H. C. HOTTEL

Professor, Massachusetts Institute of Technology, Cambridge, Mass.

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THE reporting of technical advances in industrial furnace design from representatives of some 22 different groups is enormously stimulating to anyone interested in progress in a field which has changed so profoundly in the last two decades. The advances reported on could be grouped for discussion in many different ways. Perhaps as useful as any is to discuss them as evidence of progress in the application of those basic fields of engineering and science which underlie the whole field of furnace and kiln design. These are the fields of heat transfer, energy balance, mechanics (including fluid mechanics), materials of construction, chemical process control and combustion.

Heat Transfer

There are today very few processes for which there is not a basis for a fair estimation of heat transfer rate, *in terms of local conditions.* That is, with shape and size and temperature of a heat transfer surface specified, and with flow pattern, composition and temperature of the ambient medium specified, there is today adequate knowledge for prediction of local heat transfer rate. In many (and perhaps most) furnace design problems, however, there is little comfort, and less help, to be obtained from the above statement. The missing information in so many industrial furnace design problems is the precise description of local conditions, a description which defies the engineer and forces him to accept empirical formulations of overall transfer rates in terms of end as against local conditions, and to refrain from attempting—yet—to disentangle the contributions of forced convection, free convection, non-luminous and luminous gas radiation, and solid-to-solid radiation in establishing the rate of transfer to the stock.

Examples of improved application of heat transfer principles mentioned in the brief reports presented at the ASME panel discussion include the following:

(1) The increased recognition, in the heating of stock through a large temperature interval, of the existence of different ranges of permissible or preferred heating rates, leading to the use of energy sources at different potentials for different parts of the process. Such tailored heat transfer rates are common in electric resistor furnace design; in fuel-fired furnaces they impose a more difficult design problem. Three of the contributions to the discussion referred to the heating of steel billets, all with the idea of focusing attention on what the billet can take rather than what the furnace can give. One speaker (Mawhinney) referred to the possible use of different levels of available heat as an approach to the problem of cutting down the period of high-temperature punishment of the surface; one (Bloom) described experiments which indicate what heating rates are now attained, as a preliminary to increasing them in certain ranges of operation; one (Paschkis) is interested in calculations of unsteady-state heat flow to establish new criteria (or, rather, make old criteria more quantitative) of permissible heating rates. A further example of the application of the principle of varying the potential at which heat is available comes from a contributor (Levin) who called attention to the induction furnace field where a heating process is described in which a slow (relative term) combined heating-soaking operation is followed by a faster surface temperature rise. A still further example of tailoring of the local transfer rates to the needs of the various parts of the furnace comes from the contributor (Kniveton) who describes the use of burner placement to control local rates.

(2) The extension of the field of convection heat transfer, as evidenced by the contributor (Gamble) who gives 1750 deg. F. as a temperature level at which forced convection heating is now effectively used. Without trying to be too specific about where the dividing line comes, furnace designers have carved off the low-temperature region for convection and high-temperature region for radiation. In certain fields, notably refinery tube-still design, it has been said that the greater the fraction of the total heat transfer which is carried out in the radiant section of the furnace, the better the design, that is the cheaper it is for a given job done.

However, the inability of radiation to go around corners makes many heating operations benefit by increased use of convection as a technique of ironing out differences in heating rates of outside and inside surfaces. Many problems of stock packing in relation to the establishing of local heat transfer rates have been solved empirically and with good success. An opportunity is open for further improvement by a study of the principles involved, and the student of convection heat transfer will in the future find himself more and more concerned with problems in the field of aerodynamics. Many engineers know how to set up a flow system to obtain a convection coefficient of almost any desired magnitude. But most of them say too much! Far fewer know how to obtain the minimum pressure drop consistent with a given heat transfer rate.

(3) The use of a different mechanism of heat transfer to do an old job (better, sometimes). This is what makes furnace design interesting. The use of salt-bath quenching involves a change both in the medium and the temperature level of the heat sink. The use of salt-baths for protected heating of parts to 2150 to 2400 deg. F. (referred to by both Solakian and Rosseau) substitutes a liquid-film for a gas-film coefficient at the stock surface. The use of gas quenching with high-velocity jets, (Cone) reverses the substitution; a gas film replaces a liquid film!

(4) The protective cooling of furnace parts. Mention has been made of the water-cooling of critical furnace parts by two contributors. Higher-temperature forced-convection furnaces necessitate the cooling of fan shafts and bearings (Gamble); the introduction of electrode cooling glands and of water-cooling pipes in the roof rings of electric arc-melting furnaces has greatly increased furnace life (Watson).

So much for application of heat transfer principles.

Energy Balance

No less important to good furnace design is the proper exploitation of generalizations which can be made from consideration of the energy balance in furnaces. This is enough more fundamental than heat transfer to have received earlier consideration. Greater heat economy and better quality control shared with one another the credit for the early trend from batch to continuous furnaces. An example of a variation in that trend comes from one of panel's contributors (Webber) who describes the heat economy that comes from combining several operations in a single furnace in such a way as to eliminate complete cooling between steps of the parts being processed. Here again the advantage is not solely that of heat economy more important are the simplified handling and the quality control. Enormous opportunity exists for the integration of successive furnace operations, of which the brazing-heat treating case is one example.

FIG. 1—Removing hot carburizing box from furnace at Lindberg Steel Treating Co.

Mechanics

It is easy to build something with so large a safety factor that the designer cannot possibly be embarrassed by a structural failure. The use of higher and higher temperature levels in various furnace operations leaves very little if any safety factor in many designs, and the designer is forced to make the *best* use of his materials. Circular arches in the highest temperature furnaces cannot be afforded. Rotational unbalance in fans for high temperature recirculating furnaces cannot be afforded, as one contributor has pointed out (Gamble). Controlled warpage of fans and furnace parts, referred to in the same paper, comes from a more careful consideration of thermal as well as load stresses. Those in the industry who furnish new and better materials of construction are not magicians, and designers must learn to use available materials more effectively.

Possibly able to be squeezed into the present general heading, if that is amplified to include fluid mechanics, is an important development mentioned by Dr. Robson, namely, the use of a venturi injector to pump hot air with cold and thereby eliminate the hot fan. It will be interesting to watch the extent of application of this principle, lower in mechanical efficiency than a fan, but having its compensating advantages of simplified upkeep and a temperature level limited by refractories rather than by metals.

Materials of Construction

Progress in this very important field had been mentioned in several papers. A listing of good alloys for various uses, and of cheaper and in many cases good enough substitutes for alloys has been made (Sayles). A most interesting research (Stafford) on the adverse effect of reducing gases, and even of CO_2, on the load-bearing properties of insulating firebrick doubtless explains many failures which had previously been classed as phenomenal. It is to be hoped that here, as so often is the case, the acquisition of quantitative knowledge concerning a deficiency is a predecessor to its cure. Other interesting examples of progress in materials of construction are the development of

FIG. 2—Salt bath heat treating at the American Twist Drill Co.

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better electrode alloys for immersed-electrode salt baths and better refractory pots for the same use (Solakian and Rosseau). There is no doubt that some of the reticence concerning new materials of construction is a consequence of their being on the secrecy list for the duration. It may be hopefully expected that the war will have uncovered new materials of engineering.

Chemical Process Control

Chemical processing furnaces as such did not come in for discussion at the panel, but any heating operation involving a material which requires surface protection obviously presents a problem of chemical control. Four of the contributions touched on this problem. Bright gas quenching, recarburizing, use of neutral atmospheres for clean forging, and gas pickling were mentioned (Cone). Salt baths offer another means of protected heating. Protection by exploiting the differences between the activity of hot and of cold atmospheres is a possibility in induction heating (Levin). Protection by simple combustion control to prevent unnecessarily high excess air has been mentioned by one contributor (Mawhinney). This is a particularly interesting example because it is so old and yet so important. It is doubtful whether any single advance in furnace design can yield as much in dividends as increased control over the air-fuel ratio. To talk about other advances while there is so much room for improvement here is faintly similar to discussing the calculus before one can add.

Combustion

Combustion is one process which so many have for so long taken for granted. References to patterned combustion by the use of small burner-combustion chamber combinations (Kniveton), and to the advantages of better combustion in steel reheating furnace operations (Mawhinney), constituted the only mention of trends in combustion. If all present were electric furnace engineers there would justifiably be little interest in combustion. There is no doubt that electric furnaces can do some things better than fuel-fired furnaces and certainly they merit an important place among industrial furnace types. It is also true that fuel-fired furnaces have given up to the electric furnace some fields of use which they need not have given up if the combustion process were under better control.

To burn fuel and *then* to transfer heat from it presents a succession of two problems, each moderately well known. To carry out the operations simultaneously is to raise much more difficult problems. The result is cheaper operation. Some operations put such a demand on the heating schedule as to be most safely handled by separating combustion and heat transfer. Some are so gross, so insensitive to conditions of atmosphere and transfer rate, as to be easily handled by a furnace which combines combustion and heat transfer, even though poorly. Some are borderline jobs, able to be handled in fuel-fired furnaces which mix the combustion and the heat transfer process providing they do a proper job of it. Only in the last few years has there been any precise knowledge of the mixing pattern around an open fuel gas jet and complete story of mixing in a simple jet with orifice-controlled air injection and a certain amount of self-generated recirculating is still missing. Flame placement, space requirement for combustion, perfect mixing so that combustion products at the front where they pass over the stock are uniform in composition—not only judged by comparing 2 long-time samples, but even by comparing snap samples taken in one-hundreth of a second (uniform in composition as judged by a Maxwell demon)—these are problems about which *so little* is known. It is not out of turn to call attention to the fact that there are gas turbine combustion power plants that fly—the newspapers and magazines have described them. It takes little imagination to see what enormous problems in combustion pattern control have had to be solved to make such power plants sufficiently compact to be practical. It takes but a little arithmetic to see that combustion rates attained are completely outside the field of industrial furnace experience, and it takes but a brief search of the literature to see how little there was in the way of guidance to the solution of the problems involved. It may be expected, then, that pre-war experiences will serve as an enormous impetus to industrial furnace design, and the forward-looking furnace designer will recognize potentialities of application of the new knowledge in the field of better atmosphere control, better flame placement, and consequently a closer approach to the ultimate job of tailoring the combustion and heat transfer process to the needs of the stock.

Tooling for Magnesium Welding

. . . Allowance for expansion and contraction of magnesium poses special requirements for rigid supporting of the welded structure. In designing jigs and holding devices, the problem is not only to relieve welding strains but to accommodate also for another warping factor, the locked-in strains resulting from prior operations done on the magnesium such as, rolling, braking, hot and cold forming and heat treating. Towards this end, the author presents an analysis of hold down devices, stiffeners and other tool elements and illustrates the adaptability of heavy drop hammer dies for the bases of the welding jigs.

By KENNETH L. KIME
Production Engineering, Northrop Aircraft, Inc. Hawthorne, Cal.

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DESIGN problems in the tooling for magnesium welding are in many respects similar to those of other metals. The exceptions are due to the characteristics of the magnesium. Before the more critical aspects of tooling design are dwelled upon, the following cautions or requirements should be observed:

1. The jig framework or supporting structure should be heavy enough to adequately support the remaining structure of the required tolerances, and still not be excessively bulky to interfere with the operator's movements around or in the jig. Mounts for trunnions are a prime requisite and may be either hand or power driven; the worm gear type being the most practical for ease of operation and the safety factor involved (Fig. 1). The jig structure that holds the parts being welded should be strong enough and properly supported at critical points to withstand welding strains, maintain dimensions, and provide a sufficient cooling factor so that distortion and warping of the magnesium can be held to a minimum.

2. Expansion and shrinking are two inter-related factors which must be given consideration when designing a weld jig. Neither of them may be controlled by the tooling so it is necessary to allow for, and make corrections when the amount and direction of movement of the magnesium has been determined in each part involved. There is no fixed constant that can be used to predetermine the amount of error to allow for since it is dependent on the personal element in welding, as well as the size of the parts or assembly, their design and the condition of the magnesium.

The condition of the magnesium will vary depending on the forming of the part or sheet. Whether by rolling, braking, stamping, hot or cold forming, heat treated or annealed. Unless the stresses set up in the magnesium by such forming have been relieved, buckling and distortion can be caused by parts which have high locked-in strains caused by the initial forming.

3. In every possible instance the design of the jig should be such that the welded part or assembly can be retained in the jig and placed in a heat treat oven and annealed before the clamps are removed. This will insure the correct contour or relations of surfaces when it is removed from the jig, otherwise the locked-in strains can cause warping while relieving the welding strains. On large assemblies where it is obvious that it would be impractical to put the jig in the oven or even transport it, torch relieving and hand working may be employed.

4. The jig should be accessible for the welding involved and also for the workers comfort and convenience. Poor welds are partly due to cramped working positions.

5. The clamping devices that hold the parts being welded should be adequate for the purpose and in sufficient numbers, yet they should be placed so as not to obstruct the welders movement, and they should be quick acting and positive. Several examples

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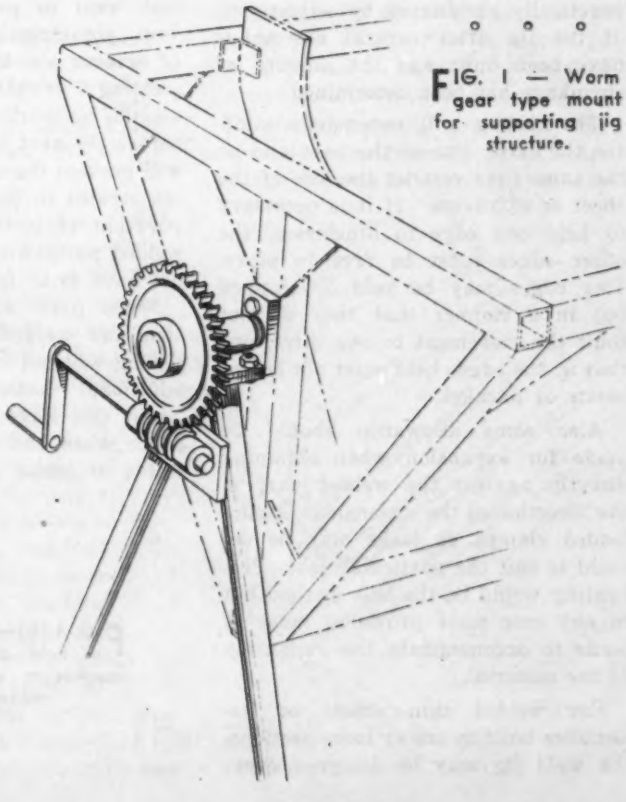


FIG. 1 — Worm gear type mount for supporting jig structure.

will be illustrated later; there are, however, unlimited possibilities for ingenuity and resourcefulness in designing holding devices indicated by the immediate tooling problem.

6. In many cases it will be advantageous to incorporate drill fixtures in the weld jigs to drill critical holes. This will be true where it would be difficult or too expensive to duplicate the tool just to drill the holes. Actually all critical holes should be drilled after strain relieving and before the part has been removed from the jig.

Extra Compensating Metal

Sufficient excess material or trim must be added to the required amount for the sheet or extrusion being welded. This extra material is used to compensate for shrinkage caused by the welding and is trimmed as the welding progresses. In this manner the amount of shrinkage can be limited to the last weld and can be practically eliminated by adjustment of the jig after several assemblies have been built and the amount of shrinkage has been determined.

The tooling will necessarily allow for the extra size of the part and at the same time restrict the size of the sheet or extrusion. If it is necessary to hold one edge to dimension, the other edges must be free to move. Two edges may be held or stopped but in a manner that they do not limit the movement to one direction; that is, the edges held must not be opposite or parallel.

Also some allowance should be made for expansion when clamping directly against the welded part in the direction of the expansion. Spring loaded clamps or jacks may be devised to suit the particular job. Preheating would be the best method but in any case some provision must be made to accommodate the expansion of the material.

For welded skin sheets or assemblies built in one or more sections, the weld jig may be designed oversize so that when the cast weld is made the parts will shrink to the desired dimension. The amount of oversize can only be approximated for the first setup. When the finished parts are checked, corrections may be made to the jig to bring the finished part to the proper size for the next assembly made in the jig. The results will be uniform only after a welding sequence has been worked out for the jig and is strictly adhered to.

FIG. 2—Sheets are drawn up due to deposit of more molten metal on topside.

In all cases the shrinkage should be confined to the last weld to prevent accumulation of errors; also the welding strains should be worked out of each weld before the next bead is started. This will prevent the accumulation of welding strains in the structure or incorporation of locked stresses and the welded parts will fit into the jig and not have to be forced into position.

When parts are forced into position and welded, strain relieving will not remove these additional locked stresses. These can have an adverse effect when the structure is tested or under actual load.

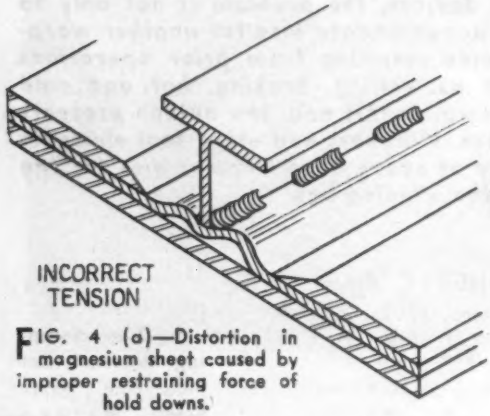


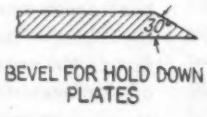
FIG. 4 (a)—Distortion in magnesium sheet caused by improper restraining force of hold downs.

RIGHT

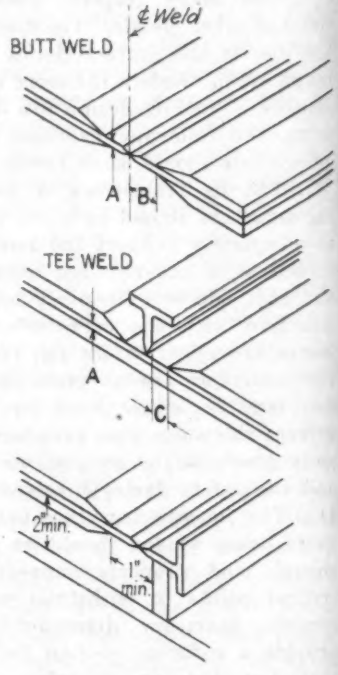
FIG. 3—Setback distances of hold down plates.

HOLD DOWN PLATE SET BACK

A Material thickness in.	B Butt weld in.	C Tee weld in.
0.040	0.20	0.20
0.060	0.25	0.25
0.080	0.30	0.30
0.100	0.40	0.50
0.125	0.40	0.50
0.150	0.50	0.60
0.175	0.50	0.60
0.200	0.50	0.60
0.250	0.50	0.60
0.275	0.50	0.60
0.300	0.60	0.70



BEVEL FOR HOLD DOWN PLATES



What might have been an adequately designed structure may show unfavorably under test. If the parts had been properly strain relieved and fitted, the design would have been adequate for the load applied.

Types of Jigs

Care must be exercised in designing male jigs or fixtures where cover sheets or extrusions completely enclose the jig on the outside. The welded assembly can shrink tight and be impossible to remove unless the jig can be relieved or collapsed from the inside. In such cases a female jig is to be preferred provided the design requirements can be met, although the oversize allowance for shrinkage is somewhat more difficult to obtain.

Female jigs are indicated for partial or full monocoque sections, and for this type construction and jig the weld seams should be on the inner surface of the skin. The reason for this is evident in the sketch. Fig. 2.

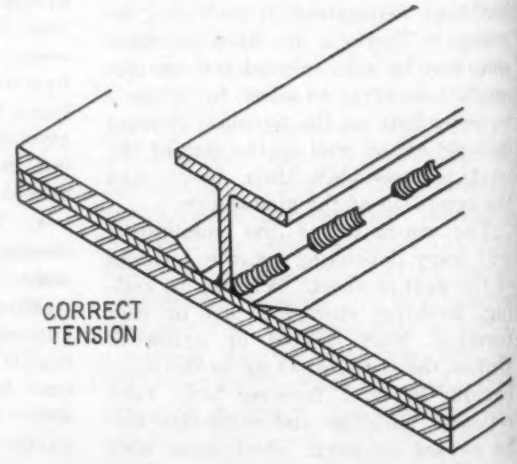


FIG. 4 (b)—Correct force of hold downs permits magnesium expansion movement.

When the sheets are welded they will be drawn up as shown. This condition is due to more molten metal being deposited in the greater opening at the top of the weld seam. The area heated is greater on this side because of the cooling effect of the back-up plate on the other side of the sheet. Advantage of this may be taken in a female jig since less forming is required to restore the desired shape, whereas in a male jig a flat spot will result that is difficult to remove. In addition, the female jig leaves the interior clear for locating frames, stiffeners and longitudinals. Access for welding and clamping devices on a male jig would require extra jig components, one for the skin and one for the inside structure.

Clamping devices for cover sheets are more easily installed in a female jig and more positive action can be attained on female than on male jigs. For cover sheets, wrap-around arrangements are about all that can be used.

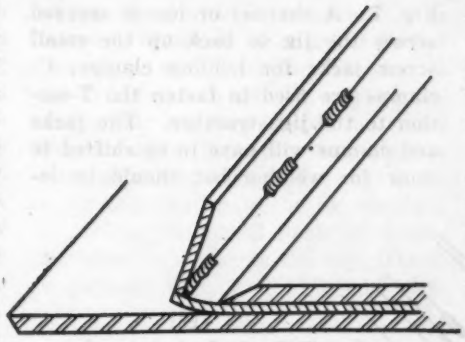


FIG. 5—Distortion resulting when stiffener is not properly held.

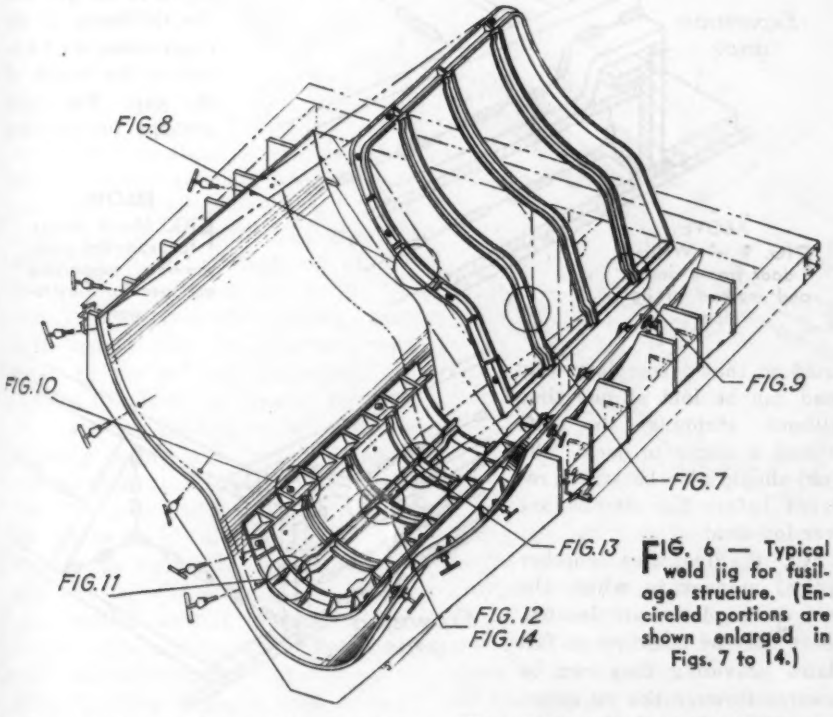


FIG. 6 — Typical weld jig for fusilage structure. (Encircled portions are shown enlarged in Figs. 7 to 14.)

Use of Hold Downs

Hold down strips or plates should be used along all weld seams. They serve a twofold service; first, as a clamp to hold the material in place and second, as a cooling medium, removing the heat from the vicinity of the weld more rapidly than if the material radiated the heat into the air.

The hold down strips should be as wide as practical. If they are too narrow they require more clamps and do not have the rigidity to resist buckling of the material. In some places narrow strips will be necessary but wherever possible they should be as wide as the space permits. Four inches width is a good average for material up to 0.093 in. in thickness.

The thickness of the plates and strips should be ¼ in. except where contours make the forming of the material difficult. In this case the material used should be as thick as the forming allows. The edge adjacent to the welding should be beveled to an angle of 30 deg. for accessibility to the weld seam. If the edges of the plates are not beveled and the edges are too close to the weld seam the arc may jump to the hold down plate. Hence the distance from the weld seam to the hold down plates must be maintained uniform. Also if the plates are too close, the cooling effect becomes too pronounced, proper penetration will not be obtained. The head, too, will be rough and porous. The distance that the plates should be set varies with the thickness of the material. Recommended distances for butt and the toe welds are given in Fig. 3.

The hold down strips should not be clamped so tightly as to restrict the movement of the material being welded. Just enough pressure to bring the material against the jig should be used; otherwise when the temperature of the magnesium is raised and it expands, the magnesium should be allowed to move under the hold down strips. If this is not done the magnesium will buckle between the hold down and the weld seam; it will pull away from the jig plate and burn through under the arc. Also when it cools after welding, contracting strains in this area will cause buckling in adjacent sections that will require considerable hand working to remove if at all possible. In addition to the buckling the material will have fine cracks appear along the line of weld where the magnesium has been restricted from contracting.

Tension Distortions

The same pressure considerations are true in holding extrusions and T-welds. Only sufficient pressure to hold the extrusion to the magnesium sheet should be used. If too great pressure is exerted, when the magnesium is soft at the welding temperature, the leg of the T or extrusion will be forced into the magnesium sheet, resulting in buckling, distortion and unevenness of the extrusion and flat spots on the opposite side of the sheet. This is shown in Fig. 4 A and is one of the hardest types of distortion to work out.

If the hold downs are set at the proper distance from the weld seam and the tension is correct, then the

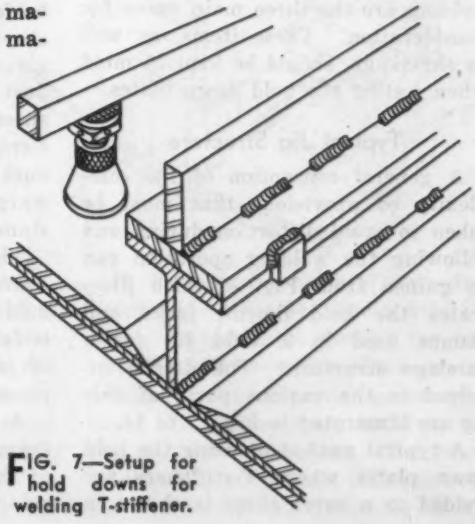


FIG. 7—Setup for hold downs for welding T-stiffener.

magnesium can expand and move back under the hold down strips or plates since there is no restraining force in the plane of movement, as illustrated in Fig. 4 B.

A similar condition as that in Fig. 4 A may result if the hold downs are too loose. The weld at the extrusion may pull the sheet away from the jig when the weld bead cools and this action can be more pronounced on corner welds at the edge of a sheet. In Fig. 5 the proper tension was on the hold down on the sheet but the stiffener was not properly held.

Pulling away from the jig may also be due to lack of care in fitting when setting up for welding. Especially on contoured surfaces, if the web or extrusion is not carefully trimmed and fitted, to bear at all points evenly along the contour, then when the weld bead is made, the sheet which is usually of a smaller cross-section than the stiffener will pull away from the jig and follow the contour of the stiffener. Too much emphasis cannot be made on the importance of the proper preparation of the parts to be welded. Fitting, contouring and tack welding are the three main items for consideration. These items. as well as shrinkage, should be kept in mind when setting the hold down plates.

Typical Jig Structure

A general conception of the complexity of provisions that must be taken to avoid distortion during and following the welding operation can be gained from Fig. 6 which illustrates the hold downs, jacks and clamps used in a weld jig for a fuselage structure. The details involved in the various parts of this jig are illustrated in Figs. 7 to 14.

A typical method of using the hold down plates where T-stiffeners are welded to a cover sheet is shown in Fig. 7. A channel or bar is secured across the jig to back up the small screw jacks for holding clamps; C-clamps are used to fasten the T-section to the jig structure. The jacks and clamps will have to be shifted to clear for welding but should be located so that a complete weld bead can be laid at one time without stopping to shift around a clamp or jack. The weld should also be strain relieved before the clamps are ever loosened.

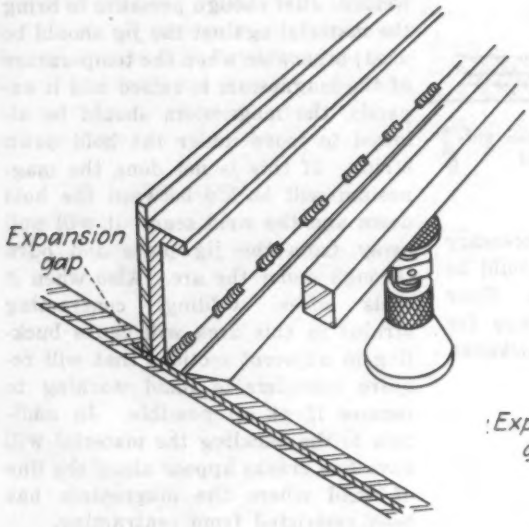


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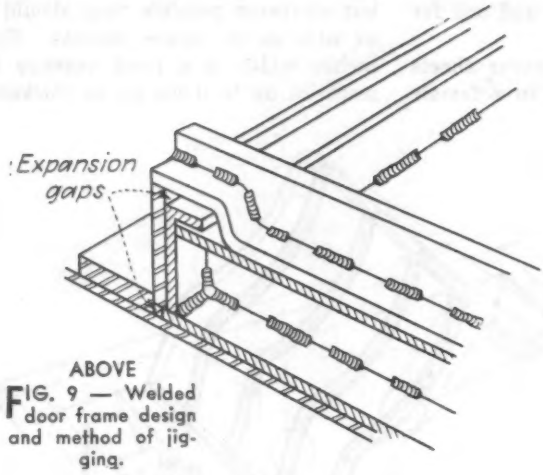
FIG. 8—Typical location of hold down plates. Small jack screws clamp the plates.



ABOVE

FIG. 9 — Welded door frame design and method of jigging.

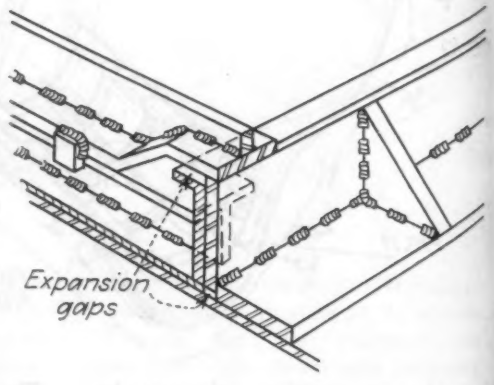
Fig. 8 illustrates another typical manner in which the hold down plates are located. These may be made up as full plates providing they can be inserted through the jig structure. Otherwise they may be broken up into sections. They must be formed to the contour of the cover sheet. The previous considerations given for clamping pressure hold true. Just enough tension to hold the cover sheet down to the jig plate is sufficient, otherwise the cover sheet will buckle and distort the door frame or warp the complete door in this instance.

The small jack screws provide a convenient method of clamping the hold down plates. A bar or channel is fastened across the jig and a series of jacks used to secure the plates in place.

A typical design for a welded door frame is shown in Fig. 9. The edge of the frame is located 0.040 in. outside the mold line of the door to allow for an overall shrinking. The cover sheet is trimmed 0.10 in. outside the mold line and the jig structure is recessed for an expansion clearance of approximately 0.187 in. After welding, the edge of the cover sheet is trimmed off flush with the side frame of the door. Another expansion gap is allowed at the top cap of the frame. This allows for expansion along the width of the frame and another gap is left at each end. Trim is left at each end as in the cover sheet.

Expansion Gaps

The jig construction in Fig. 10 shows a typical method of designing for expansion gaps. The width of the magnesium cover sheet determines the depth of the gap and the thickness of the magnesium determines the width of the gap. The right amount for medium sized sheets is about 0.187 in. This will take care of 0.10 in. for trim and allow 0.087 in. for expansion which in most cases will be ample. The width of the gap should be approximately 0.020 in. larger than the thickness of the cover sheet, which will allow for movement parallel to the surface.



BELOW

FIG. 10—A design for expansion gaps, showing supporting member for T-extrusion.

The jig construction in Fig. 11 is similar to that in Fig. 10 except for the supporting member for the magnesium T-extrusion. Here the angle is better adapted to cover sheets where no contour is encountered. The joggle may cause some difficulty. In such instances the construction as in Fig. 10 will be easier to form the width of the expansion gap for the door frame. Any amount for rea-

sonable clearance of the parts will be sufficient.

The arrangement shown in Fig. 12 for locating and holding T-section stiffeners serve the purpose for intermittent welds, but for solid welding there should be allowance for expansion. In order to keep the jig structure from moving and to maintain the proper tension on the parts being welded, the jig structure will have to

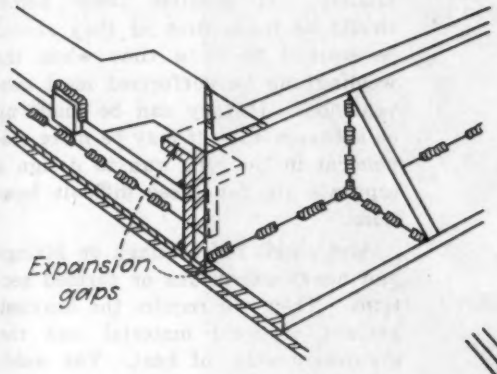


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FIG 11—A variant of Fig. 10. The supporting member has a joggle.

be clamped in place, care being taken that too much clamping pressure does not cause buckling or "cans." The greatest difficulty with this type jig structure is the setting up of the parts and the fitting, and to get the best results from the welding, each T-section should be trimmed and fitted as the welding progresses.

Fig. 13 shows a typical jig construction for holding a bar stiffener running across the contoured sheet and located by an angle with stops. The T-section stiffener is held on the contour with a built-up T-section of steel strips formed to the contour and also located with stops.

A typical method of holding and locating bar stiffeners and T-sections on a curved surface is illustrated in Fig. 14. The angle is used to support the stiffeners running normal to the curve because of the difficulty encountered in rolling angle sections. A formed T-section supports and locates the stiffeners running with the curve. The stops on the angle locate the T and bar stiffeners of magnesium on one side only which allows for any creep due to heat. More consideration must be given to clamping pressure with this type of construction which is less flexible.

Use of Jig Templates

The use of jig templates for the construction of weld jigs is probably the most important point to be considered. On contoured plates where cover sheets are welded, and on monocoque and nacelle sections where contours and tapers predominate a setup of jig templates is essential. The oversize required to compensate for shrinkage should be incorporated in the template. Naturally any adjustments for welding should be noted thereon after the first assembly has been welded and checked.

Another feature of the jig template, in tooling for small parts or subassemblies, is to fasten the template to a suitable base, and to mount clips and stops, etc., to the lines on the template. Clamps are also provided for holding purposes. This type of construction is to be used only where there is no need to provide for backing-up or hold downs or when the effect of shrinkage is negligible or there are no contours.

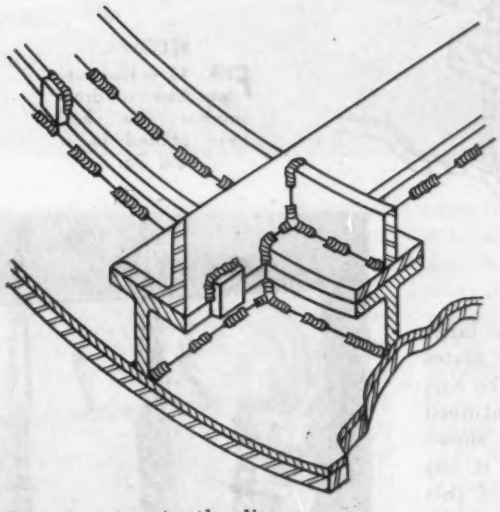

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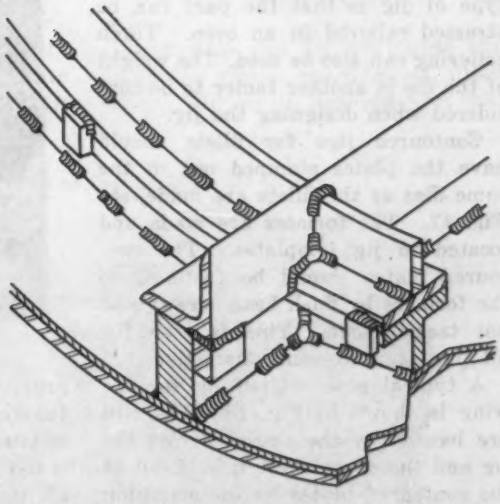
FIG. 12—Location of T-section stiffeners for intermittent welds.

BELOW
FIG. 13 — Use of bar stiffener across contoured sheet.



Use of Drill Fixtures

Attachment holes, clearance holes or in fact any openings other than lightening holes should not be drilled until all welding has been completed and the part has been stress relieved. The expanding and contracting during welding combined with such hand forming as may be necessary, will cause the metal to flow or creep, and this will cause the holes to shift in the general direction of the greatest movement; hence, all critical holes must be left until the last operation.

In extreme cases, where it is impractical to use clamps, holes may be drilled through the sheets and bolts used to hold the parts to the jig. Clearance must be allowed around the bolts for shifting of the material, and the same pressure considerations allowed as for hold down strips. These holes must be plugged and the surface finished down before the structure is strain relieved or any holes drilled for attachment points, etc.

Drill fittings may be designed to be removable to make the jig more accessible for welding. This is not good practice, however, for holes that must be line reamed. Holes that are matched to some other assembly should be permanently attached to the jig, but if the whole pattern can be incorporated in one fixture no trouble should arise if the fixture is carefully indexed to the jig.

In Fig. 15 is shown a zinc drop hammer die reworked into a weld jig. This is a practical method for contoured surfaces where there are no weld seams which require grooves, because the die would not stand up under the heat of the arc. The heavy steel angles along each side are reinforcements for the attaching of the

locating members for the ribs. The skin sheet is held to the die with the quick acting clamps as are also the hold down bars.

The skin sheet is first trimmed 0.10 in. outside the mold line of the part as scribed on the die. Then it is located in the die and the ribs and stiffeners welded in.

Dies make the most economical jig base for doors and removable panels. After the parts have been stamped out, the dies continue to be used as part of this jig. This saves the large labor cost of contouring heavy plates to match the dies and lowers the cost of making the dies by their continued use. The illustration, Fig. 16, shows the door frame in place after it has been welded. The advantage of this type of jig is that the part can be stressed relieved in an oven. Torch relieving can also be used. The weight of the die is another factor to be considered when designing the jig.

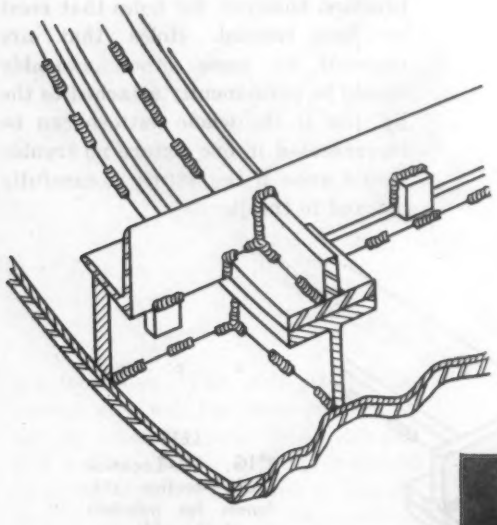


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FIG. 14 — Method of locating bar stiffeners and T-sections on curved surface.

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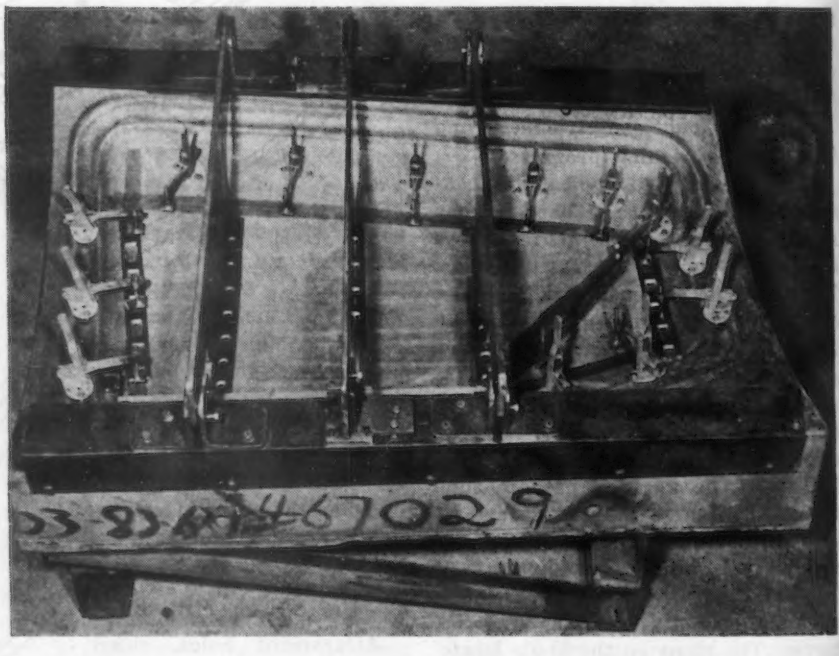
BELOW

FIG. 15 — Illustrating how a drop hammer die has been utilized in a weld jig.



Contoured jigs for fillets should have the plates stamped out in the same dies as the fillets are made, see Fig. 17. The formers are made and located to jig templates. The contoured plates should be fastened to the formers by flush head screws and not tack welded. This is true for all jigs as it prevents distortion.

A typical nose section jig for the wing is shown in Fig. 18. The ribs are located by the angles across the jig and the cover sheet is held out to the contoured plates by the clamping fixtures, three of which are shown in place. The contoured plates are supported at each rib station by formers.

Welding Procedure

In order to save time on the job, determine which part should be welded first and the sequence of welding and also to have some concrete data on which to base any changes to be made in the welding sequence, it is imperative that there be a written procedure for welding each assembly or part. This work should be done by someone who is experienced in fabrication, welding, tool design and tool planning. The procedure should not be too brief, nor should it be bulky with unnecessary details, but complete and directly to the point. In many instances the success of the tool depends upon the adequate presentation of the way the tool is to function, combined with the proper welding sequence. If the procedure is too sketchy, the tool will not develop all its possibilities and the finished product wil be rejected.

Also, if the procedure is not followed strictly, and if any deviations are not noted that appear during welding or setting up, there is nothing to guide the worker on the next assembly to be fabricated in that jig.

The need for careful study in working out the welding procedure cannot be overemphasized, and is reflected in the time saved in the shop, labor cost and material cost as well as uniformity of the finished product.

Analysis of Structure

The first step in writing a weld procedure is to study the structure to be jigged. Note the inaccessible points or those most difficult to reach for welding and determine their location in the jig, also the method of holding. If possible these points should be made first or they should be worked in at a time when the welding can be performed most conveniently. If they can be made up as subassemblies, it may be more economical in the long run to design a separate jig for these difficult locations.

Also check for castings or fittings and heavy extrusions or formed sections. They will require the heaviest amount of weld material and the greatest amount of heat. The welding of these heavier parts should be done as early as possible in the welding sequence and strain relieved so that the amount of heat and the resulting expansion will not buckle plates or stringers, etc. Distortion caused by welding in castings or heavy sections will be very difficult to work out due to the lack of flexibility of the larger mass of metal and its resistance to any change in position and shape. Care should also be exercised when welding in castings or formed shapes of intricate or fragile design. The expansion and contraction of details welded to them may cause distortion, locked-in strains,

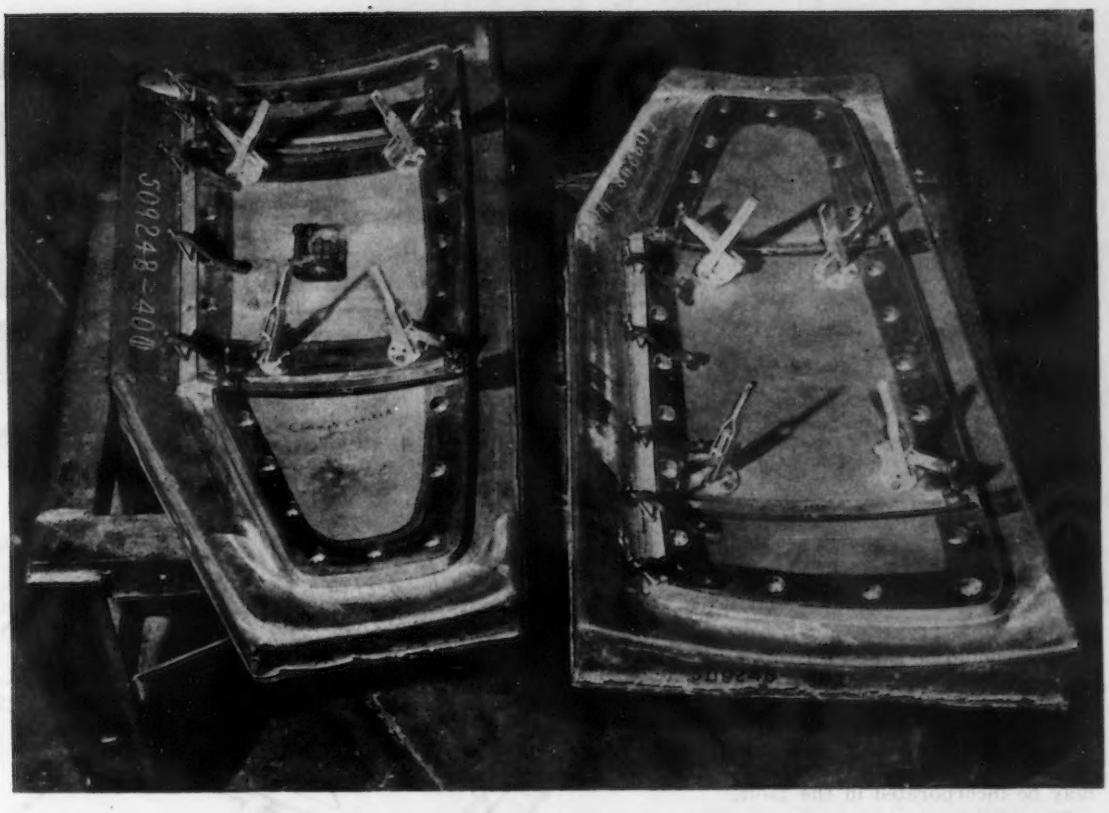


FIG. 16—Die used as jig base for door frame, shown welded.

breaking or cracks difficult to notice with the eye, especially if the casting has been put under strain that just equals the ultimate yield point of the metal.

In many instances it will be found more convenient to break down the structure to be fabricated into smaller units and then combine them into the completed structure in a sew-up jig. This is satisfactory if the shrinkage on the jointing weld does not affect the basic dimensions of the structure.

There are two fundamental reasons for making subassemblies—to facilitate welding by doing the more difficult sections first or as separate units, and to increase the rate of production by making a greater number of smaller units in a reduced amount of time.

In determining whether there will be a need for unit assembly, it must be kept in mind that the shrinkage must be held to the last weld in order to control the total amount of shrinkage for the whole structure.

Welding Sequence

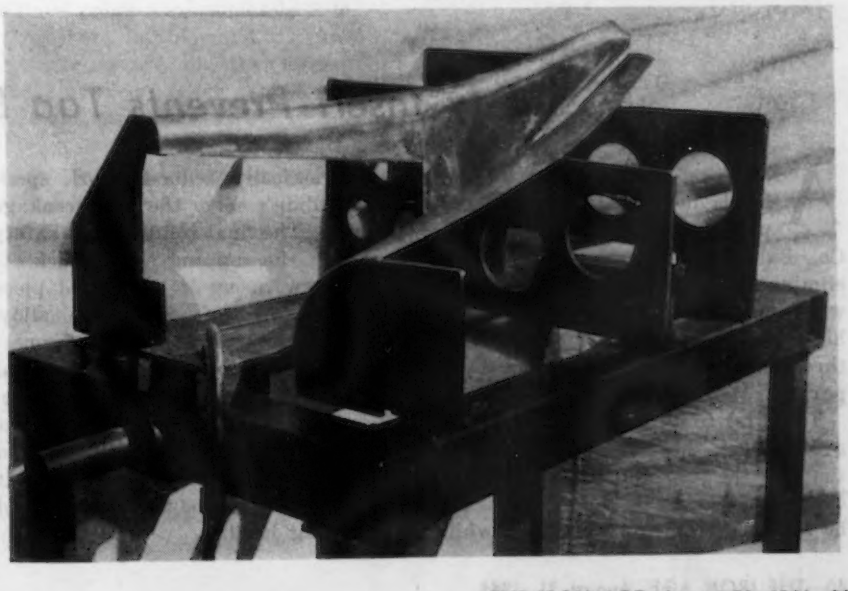
In order to limit the shrinkage to the last weld, a starting point for the welding sequence must be determined. It may start with one edge of an assembly and advance progressively across to the opposite edge, or it may start in the center or some other point and progress to both outer edges, or it may start somewhere in the body of the structure and grow out in all directions to the edges of the structure. The design determines this and must be ascertained from the particular assembly to be constructed. No definite rule can be laid down other than to pick out the key point where the work can start and progress uniformly, strain relieving and removing buckling as the welding goes along in order to prevent or minimize locked strains and warping and to be able to do the final weld with the shrinkage limited to this last bead.

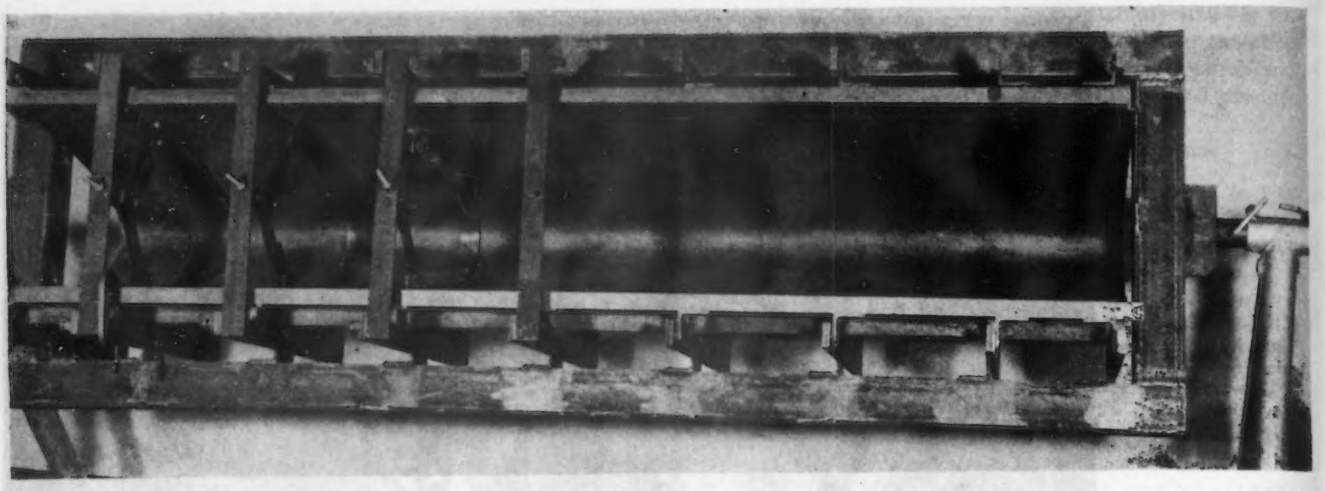
There will be exceptions and problems encountered where this may seem impossible, but if the welding procedure is revised and kept up to date as these more difficult sections are worked over, eventually after several trials a procedure can be worked out by the shop.

All parts for welding should be specified oversize on lengths for extrusions and with edge trim for plates, doublers and sheets. The first part welded in can most usually be trimmed to size to start, although it is better to trim each part for each weld.

In female jigs for contoured surfaces, the covers are trimmed, fitted, welded and strain relieved first with

FIG. 17—Application of contoured jigs for fillets.





trim left all around until the last weld has been completed. The stiffeners, frames, etc., are then fitted, trimmed, welded and strain relieved as the work progresses. Strain relieving should be called for after each weld bead has been completed if there is any indication of buckling or distortion or at any time when there is a possibility that a locked-in stress may be incorporated in the joint.

The following is a typical weld procedure for the access door shown in Fig. 19:

(1) Place cover sheet (2) in jig (jig not shown).

(2) Locate stiffener (8) in place and clamp. Do not trim ends.

(3) Weld stiffener (8) to cover sheet (2).

(4) Strain relieve and straighten.

(5) Fit and trim stiffeners (12) in two places. Leave trim on outer ends.

(6) Weld 12 stiffeners to (2) and (8) starting at (8).

(7) Strain relieve and straighten.

(8) Fit and trim stiffeners (10) in two places leaving trim on outer ends.

(9) Weld stiffeners (10) to (2) and (8) starting at (8).

(10) Fit and trim frame (6) two places. Leave trim each end.

(11) Weld frames (6) to (2), (10) and (12).

(12) Strain relieve and straighten.

(13) Trim ends of (6) and (8). Fit and trim end frames (4) at each end of door.

(14) Weld and frame (4) to (2), (6) and (8) starting at (8). Tack-weld (4) to (6) at each end.

(15) Strain relieve and straighten.

(16) Drill holes for Dzus fasteners in 10 places.

(17) Chrome pickle and paint per specifications.

(18) Install Dzus fasteners.

ABOVE

FIG. 18 — Method of handling contoured plates is shown in this typical nose section jig.

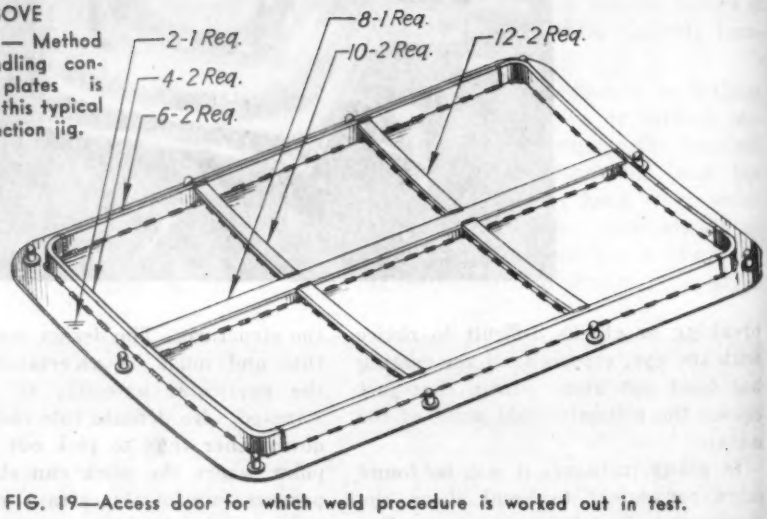


FIG. 19—Access door for which weld procedure is worked out in test.

Safety Insert Prevents Tap Breakage

A NEW safety insert for tapping heads developed by three employees of The Glenn L. Martin Co., Baltimore, has almost completely eliminated tap breakage on jobs where this factor previously ran as high as six taps per 8-hr. shift in threading hard, heat treated steel parts.

The first innovation was cutting a groove near the top of each tap, so that if the tap did jam, it would break at this weak point and could be removed from the work. But while this drastically reduced work spoilage, it didn't solve the tap breakage problem. The final solution is a safety insert in the tapping head chuck.

The new insert is a grooved piece of Zamak, a soft zinc base alloy, which replaces the steel jaws formerly used in the chuck. It is identical in size and shape to the jaws it replaces except that the insert is cast in one piece. Each insert can be used only with the size tap for which it is designed. It can be used in any kind of tapping head.

With the new insert, when a tap jams, the soft metal of the insert slot wears away, permitting the tap to remain stationary while the tapping head continues to rotate. The metal is soft enough so that it gives away before sufficient torque is generated to break the tap, but hard enough to hold the tap in place during normal operations. By rotating the insert to a new position each time a tap jams, the same insert may be used approximately 15 times, after which it can be melted and recast.

Organic Coating Aids Magnetic Inspection

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By GILBERT C. CLOSE
Formerly With Douglas Aircraft Co.

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MAGNAFLUXING an aircraft engine mount previously coated with synthetic white primer-surfacer. Note the light color of the metal which makes the magnetic indications stand out prominently. *Courtesy Douglas Aircraft Co.*

PRIOR to the development of a critical shortage in cadmium metal, many aircraft companies had adopted the practice of flash coating steel parts to aid in magnetic inspection. The purpose of the cadmium flash coat was to provide a bright, lustrous background against which the dark, ferromagnetic particles would stand out sharply. Despite the fact that the flash coat was very superficial, considerable of the precious cadmium metal was used in this application.

When WPB conservation orders stopped the use of cadmium for this purpose, engineers of the Douglas Aircraft Co.'s El Segundo plant began searching for a substitute background material that would serve as well as cadmium and that was not on the critical list. Metal dyes were tried with limited success. The dyes had a tendency to wash away in the petroleum solution used for suspending and applying the ferromagnetic inspection powder.

After considerable investigation work, a coating material was formulated that in every way serves the purpose as well as cadmium. Moreover this material is quicker to apply and cheaper than the cadmium flash coating process.

Primer-Surfacer Used

The material now in use consists of a synthetic hi-solids white primer-surfacer (1 part) cut by approximately 4 parts of toluene substitute thinner. This formula produces a white or very light background against which the magnetic indications are easily discernible. It is not affected by the magnetic solution, nor does it impede contact between the electrodes of the magnaflux machine and the part undergoing inspection.

Preparation and application of the primer-surfacer coating is very simple. The parts are first sandblasted to thoroughly remove all scale, surface oxides, rust and other impurities. As soon as possible after sandblasting, the parts are coated to prevent other accumulations of surface dirt.

The primer-surfacer coating is applied with the usual type of spray gun. The most satisfactory coating is obtained using approximately 8 lb. of air pressure in the paint pot and 30 lb. air pressure on the line. The freshly applied coating should be wetly translucent, without strong evidence of pigmentation. When such a coating has dried it will be sufficiently white for the purpose.

Approximately 1 hr. should elapse after spraying before the parts are inspected. This will give the coating sufficient time to dry, and will preclude the possibility of any of it washing away with the inspection fluid. When parts are to be subsequently finished with an organic coating, it is not necessary to remove the primer-surfacer coating. When, however, the final finishing will be by plating, the primer-surfacer coat can be removed by either a liquid solvent wash or by a light sandblast.

Mixing of the primer-surfacer coating material should be carefully controlled. Not more than a four day supply should be mixed at one time. The material should be well agitated during mixing, then strained through fine cheese cloth prior to use.

May Be Permanent

This process, though developed as a stop-gap measure due to the shortage of cadmium, lends every indication of permanently replacing the older flash-coat method. Nothing other than a spray gun and spray booth are required in the way of factory equipment. And for the smaller plants not equipped with a cadmium electroplating setup, it offers the solution to a problem without recourse to costly subcontract flash coating work.

In conclusion it may be stated that use of a background coating material during magnetic inspection is of definite value. During the investigational work preceding development of the primer-surfacer coating material, parts with a known number of defects were inspected both with and without a background material. From 75 to 100 per cent more defects could be detected against the background coating than against the dull gray of the uncoated steel. Use of the background material eliminates a great portion of the eyestrain usually experienced by magnetic inspectors.

Torpedoes Assembled In Machine Setups

. . . In order to assure precise alinement of the five sections of an 18 in. naval aircraft torpedo, at the Bullard Co., final fitting and assembly is done with the aid of fixtures on a Cutmaster vertical turret lathe. The centerline method is used throughout in the machining operations on the principal components. Other unusual operations are also illustrated.

FROM the engineering department of the Bullard Co. at Bridgeport have come developments that produce the naval aircraft torpedoes with new precision and dispatch. Disclosed for the first time with the permission of the Navy's Bureau of Ordnance, these engineering innovations include a method for precise over-all alinement of the torpedo and methods for achieving complete interchangeability of parts fixed to the curving sides of the casings.

These and other engineering achievements help to put together more quickly and accurately the 4000 pieces that make up an 18-ft. "tin fish" capable of breaking the back of an enemy warship.

All torpedoes are precision instruments. Aircraft torpedoes, Fig. 1, which are dropped into the water from a height of several hundred feet, must not only be precisely made but must also be rugged.

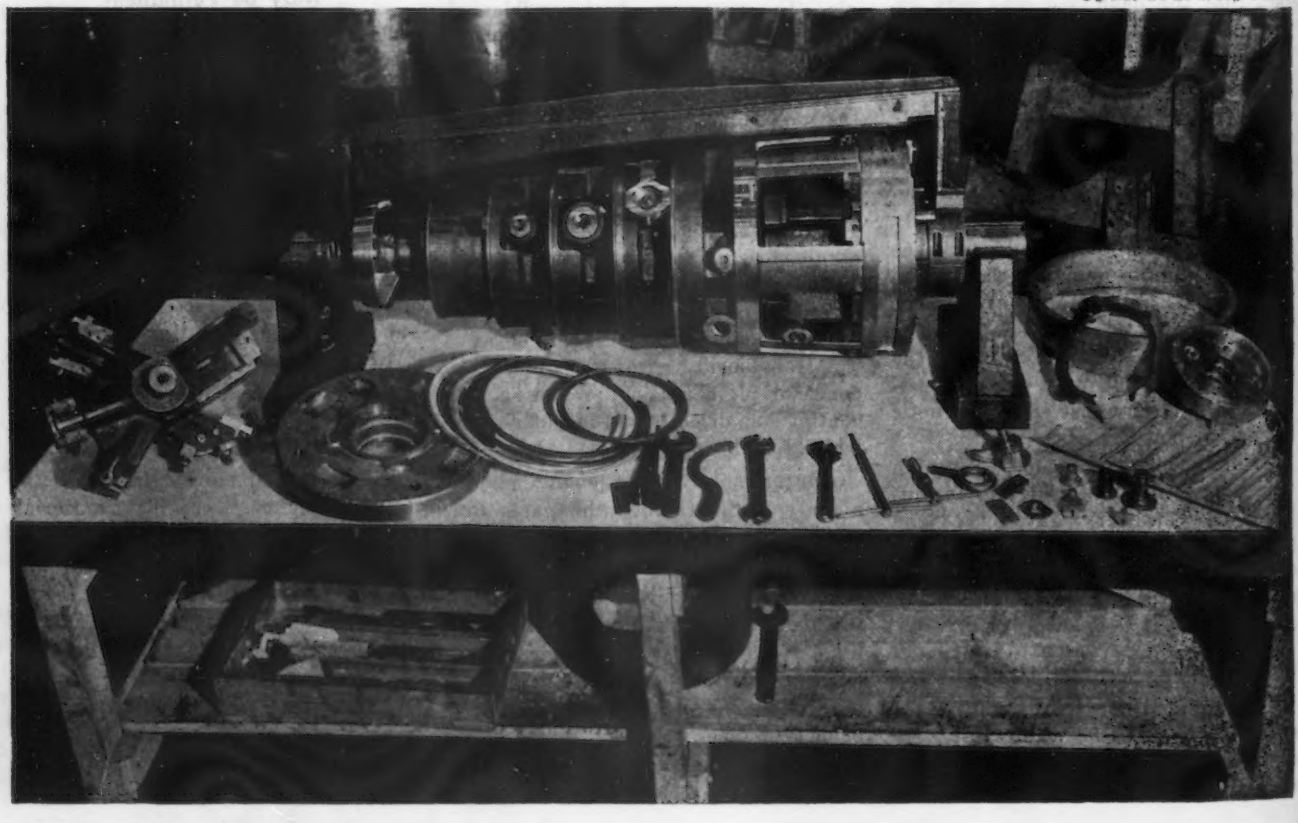
Precision has always been difficult to attain in the over-all alinement of a torpedo, particularly since it has five sections—the warhead, air vessel, balance chamber, afterbody and tail—weighing in all nearly three-quarters of a ton. Even though these five sections are permanently riveted and sweated together, a torpedo supported on horses will sag as much as 1/32 in.

This particular problem was solved simply by assembling the torpedoes vertically, eliminating all sag. But, more important, was the decision of the Bullard Co. to establish a common centerline for all its torpedoes and to develop the jigs and fixtures, mandrels and arbors that would make this centerline a positive control for all measurements.

The application of this centerline

FIG. 2—An operation that formerly took days is reduced to a few hours by the Bullard-designed turning arbor shown. In it are turned 17 fixed fittings for the afterbody of an aircraft torpedo. A duplicate set of fittings and some of the tools used to insert them are on display in front of the arbor. The knife gage used to check the finished radius of the fittings is in place.

Official U. S. Navy Photo



Official U. S. Navy Photo

FIG. 1—This is an aircraft torpedo built under revolutionary methods by the Bullard Co. The torpedo will withstand the shock of hitting the water from a height of several hundred feet, then race accurately on its course to smash its lethal warhead against the bottom of an enemy ship.

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theory starts with the casings, which are hammered to an inside diameter within close limits upon an accurately machined mandrel.

Fixed Fittings Used

Prodigious savings in time are gained by applying this centerline method in preparing parts of the mechanism known as the fixed fittings, which are bedded and riveted to the curved sides of the torpedo casings. There are 26 of these fittings in the balance chamber, 17 in the afterbody, Fig. 2, and five in the warhead.

It had previously been customary to machine these fittings one at a time to correspond as closely as possible to the contours of the casing, and then finish the job by hand fitting—a long and tedious process.

Today these fixed fittings for each section of the torpedo are machined accurately and simultaneously in Bullard-designed turning arbors on horizontal lathes (see Figs. 2 and 3). Because these arbors have the same centerline and radius as the mandrel on which the casings are stretched, the fittings bed with precision, eliminating all hand-fitting. The 26 fittings for the balance chamber, for example, are finish-machined in 4 hr. Hand fitting ran into days.

Envelope Jig

Proportionately large savings in time are effected in drilling the casing sections for rivets. Because the fixed fittings will now locate themselves accurately inside the torpedo, the casing can be slid over them while they are still in the turning arbor. Then the casing is lowered into an envelope jig, Fig. 4, and all rivet holes drilled through into the fittings with a radial drill at one setting.

The time saving is graphically illustrated by the fact that these envelope jigs precisely locate 551 rivet holes in one section of the torpedo, 366 in another and 162 in a third.

Precise balance and alinement of a torpedo are vital as well as difficult of achievement. Upon them depends the functioning of various controls set into action automatically as the torpedo leaves the plane. Upon alinement, too, depends whether or not the torpedo will carry its devastating load of high explosive straight to its target.

Each section is constructed sepa-

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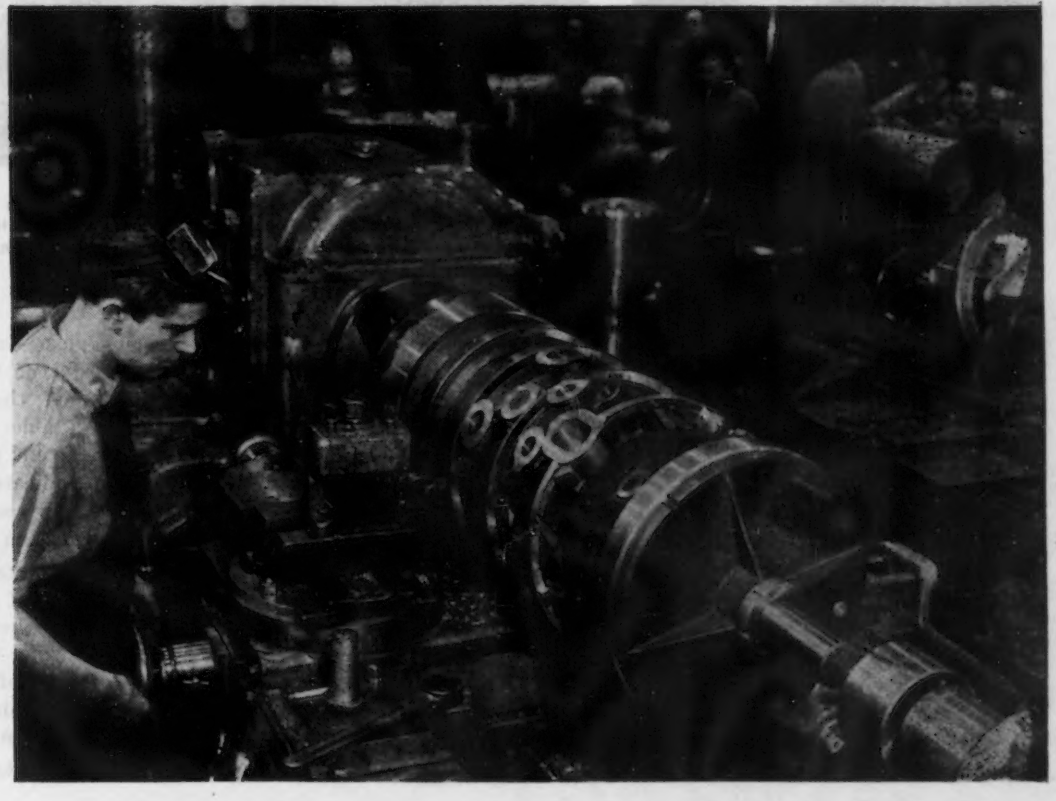

FIG. 3—Twenty-six fixed fittings for the balance chamber of an aircraft torpedo are being turned in 4 hr. on the arbor shown on the lathe. Taper attachments control the cut, whose final radius is checked with a knife gage. It has previously been customary to machine each fitting separately and then hand-fit it to the torpedo casing. Turned in the arbor shown, the fittings bed themselves with precision.

Official U. S. Navy Photo

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rately. At Bullard, each section of casing and each part of the mechanism in the casing are accurately located in relation to the centerline. With this method, each step in manufacture contributes to the alinement of the entire torpedo, but the final and complete check comes during the final assembly, which is accomplished on a Bullard Cutmaster vertical turret lathe with a 74 in. revolving table, Fig. 5. Its value as both a working machine and a giant sort of jig in final erecting of a torpedo lies in the fact that its uprights are in axial alinement with its table to a closer tolerance than is required for any torpedo measurement.

Through assembly on the Cutmaster, it is proven that each section of the torpedo is in alinement and concentric. When the tail unit is assembled, the vertical and horizontal axes of the tail are demonstrated to be within 0.005 in. of the true center and the radial position of the tail within that same limit.

Assembly starts with the mounting of the air vessel, forward end down, in a fixture which has three adjustable uprights. Registry keys in the fixture correspond to slots in the forward end of the air vessel. The two ends of the vessel are held in concentricity through adjusting screws in the uprights of the fixture and check is made with an indicator.

The Cutmaster table is then revolved and the angle is cut on the aft circumference of the air vessel where it will be joined to the balance chamber.

The balance chamber is then lowered onto the air vessel. The pieces will locate and mate exactly because the registry slots in the aft end of the balance chamber and in the forward end of the air vessel are all located off the surface of the Cutmaster's table.

The aft end of the balance chamber is then indicated to run true, Fig. 6, and the two sections are riveted together to form the forebody.

After an intermediate step to check the location of various mechanisms in relation to the centerline, the afterbody is swung into place and secured. The aft end of the afterbody is then indicated to determine that it runs within 0.001 in. total reading.

The accurate relationship between

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FIG. 4—An aircraft torpedo afterbody section is shown being lowered into an envelope jig which will permit more than 500 rivet holes to be drilled at one setting through the afterbody casing into the fittings.

Official U. S. Navy Photo

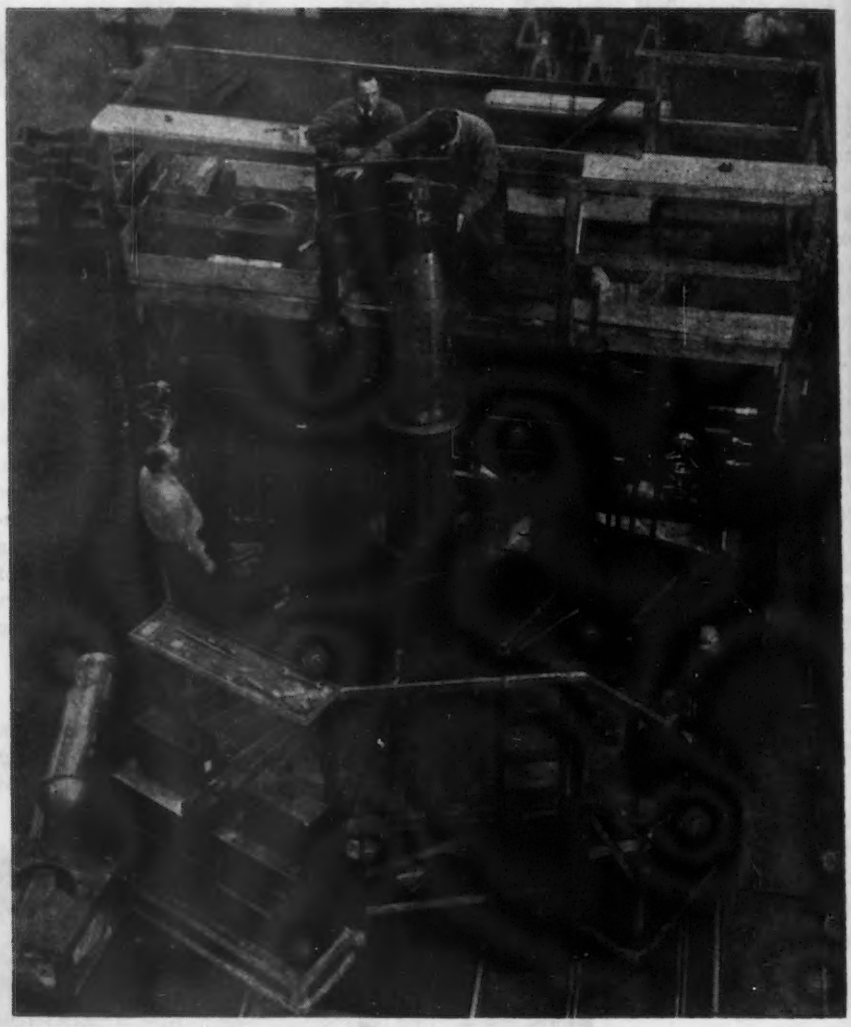

FIG. 5—An 18-ft. aircraft torpedo is shown in place on a Bullard 74-in. Cutmaster vertical turret lathe. A final check is in process to prove that the centerline of the torpedo has been established and maintained throughout manufacturing and assembly.

Official U. S. Navy Photo

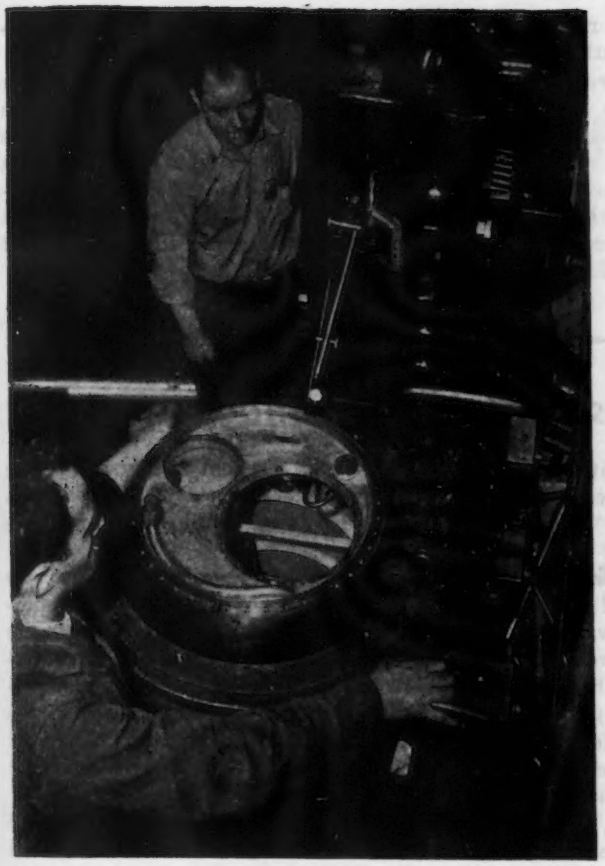

FIG. 6 — The aft end of the balance chamber for aircraft torpedo is shown here being checked for concentricity as it revolves on the table of a 74-in. Bullard Cutmaster. The indicator is on a control arm operated by the left-hand ram of the vertical turret lathe.

Official U. S. Navy Photo

the Cutmaster table and its uprights and crossrail comes into play again when the tail section is assembled to complete the torpedo. The torpedo is indexed, through four registry slots exactly 90 deg. apart in the mounting fixture on the table, so that its horizontal centerline is parallel to the face of the Cutmaster. An indicator on a control arm is then moved along the crossrail and reset to zero at the forward end of each forward fin (see Fig. 5). Readings are then made to insure that the variation in height of the fore and aft fins from the axis of the torpedo is not more than 0.005 in.

A bearing in the propeller shaft is next indicated to a total runout of not more than 0.005 in.

The position of the axis of the tail with relation to the torpedo's axis is then determined. The torpedo is rotated until both horizontal fins are the same distance from the face of the Cutmaster. The torpedo is indexed 180 deg. and the readings in this case must not vary more than 0.010 in. The same procedure is then used on the vertical fins. The average of the four readings locates the true center of the torpedo and the average of the readings on each fin must be within 0.005 in. of that figure. The radial position of the tail is determined in a similar manner.

This final check of the complete torpedo proves that its centerline has been maintained throughout manufacture.

Other engineering innovations have been introduced throughout the manufacturing process. Many types of centering bars and arbors have been developed to permit multiple operations at the same settings and permit various machining cuts to be taken in constant relation to the centerline.

An important phase of tool engineering work was performed in designing a rocker jig to permit milling

FIG. 7—This rocker jig produces a 50 per cent time saving in preparing the flat surfaces of propellor blades for aircraft torpedoes. A cam motion feeds the propellor under the milling cutter and in effect generates a series of lines which produce a surface ready for polishing.

Official U. S. Navy Photo

of the flat sides of propeller blades for the torpedoes. Under the Bullard method, the flat sides of the blades are ready for polishing after two cuts. Previously, it was necessary to finish grind before polishing. The rocker jig permits savings up to 50 per cent of the previous time for the operation.

The fixture has a semi-circular, concave bed to which a cradle is gibbed. On its under surface the cradle has a cam path which rides over a roller on a rectangular bar. The latter slides in a groove in the base parallel to the axis of the cradle. The outboard roll is secured to the base of the milling machine while the fixture is mounted on the table and is fed longitudinally under the cutter. As the table is moved, the cradle is cammed around its own center, carrying the propeller with it.

The cam on the periphery of the cradle is so designed that the flat side of the blade is generated by a series of lines which remain parallel to a plane through the axis of the propeller nut and which rotate at right angles to this plane about the axis of the blade.

Vertical Oven Overcomes Shrinking Spoilage

UNIFORM heating of bronze surface liners to be shrunk on the tail section of marine line shafts has been successfully solved by the use of a vertical oven developed in the Joshua Hendy Iron Works, Sunnyvale, Cal. Faced with a high percentage of spoilage and lack of precision in the conventional method, engineers at the Hendy assembly shop devised their own equipment.

The tubular liners are 12 ft. 8⅞ in. long, 19 15/16 in. o.d., and 1 1/32 in. thick. They cannot be salvaged if they have been improperly set on the shaft; a costly loss in every case.

Under the method generally in use, the tubular liner is heated with torches until it has expanded to an adequate point. The cold shaft is then slipped inside it and the liner is permitted to shrink into position. This process usually takes from 4 to 6 hr. After the shaft has been inserted, cooling is frequently uneven or too rapid, with the result that the liner freezes in the wrong position on the shaft and must be removed by cutting, an additional expenditure of time as well as a loss of valuable material.

In comparison, the Hendy process takes only from 1½ to 1¾ hr. from start to finish, and freezing of the liner in its proper position is assured since there is perfect control of temperatures.

The vertical heating chamber, constructed to accommodate the entire 19-ft. 4⅛-in. length of the shaft, exclusive of the flange, was constructed down from the floor level. It is metal-lined and insulated. When the bronze liner has been put in position in the chamber and checked for accuracy of placement, two electric hot air furnaces go into operation. One, at the bottom of the chamber, heats the outside of the liner. The other, at the floor level, connects with the chamber by means of a tight cap and directs super-heated air to the inside of the cylinder (see Fig. 1). Thus, perfect uniformity of heat is assured. Three thermometers report on temperatures at the bottom, center, and top of the chamber.

When two set micrometers at the top of the liner show that it has expanded sufficiently, the upper furnace is disconnected while the lower furnace continues to heat the outside surface, keeping the expansion of the tube at a constant point. The cold shaft, equipped with a special spacer to insure correct position of the liner, is then lowered into place, Fig. 2, and the lower furnace is turned off. All handling is done by crane, with special clamps to hold the liner and shaft, thus adding a special safety factor not present in previous method.

BELOW

FIG. 1—Upper furnace in place over end of heating chamber sends super-heated air inside the liner. Second furnace at bottom of chamber does likewise for outside liner.

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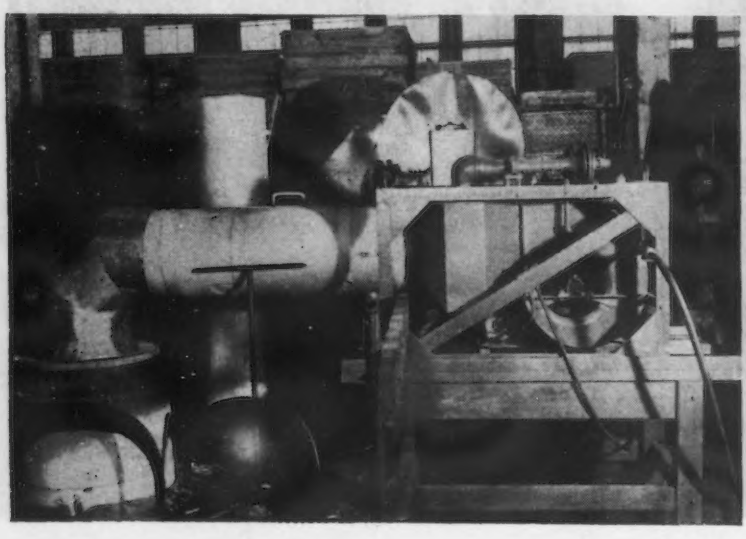
FIG. 2—Crane lifts out tailshaft after liner has been shrunk into place. Note special spacer at top by which correct position of shaft is assured.



Insulation of Steel Plant Equipment

. . . In concluding this two-part article, insulating cements, concrete and coatings are discussed. In addition, a full explanation of the meaning of thermal conductivity and the factors influencing it are given as well as methods for its computation.

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INSULATING bricks, like refractory bricks, can be laid with cements of similar composition. Thus, various diatomite base cements are made for use with diatomite bricks. Such cements usually contain a litle clay or other plasticizer, and this can effect the properties, in particular the shrinkage tendency, quite seriously. Joints should therefore be as thin as possible. Jointing material can often be dispensed with completely where well-shaped insulating bricks are set between an inner and outer wall or case. There is still some difference of opinion as to whether insulating bricks should be tied-in with refractory bricks. There is always the theoretical argument that their expansion properties are different, but insulating materials are relatively flexible and can therefore accommodate some distortion.

Diatomite cements can also be used as a plaster, but more recently installations often employ vermiculite. This can be plasticized by adding clay, bentonite, for example, while fibrous insulating material is sometimes mixed with it to give additional tensile strength. The product can then be used as an external coating on brickwork. Nails driven into joints in the brickwork can be used to keep the coating in position.

Concrete: Insulating concretes are mainly of two types: Those made by mixing crushed diatomite brick with aluminous cement, and those made by bonding crushed fireclay insulating bricks with aluminous cement or aluminous clay.

Coatings: Insulating bricks are often protected when used as hot face insulation, that is when exposed to the furnace gases, by means of a refractory wash. This seals the surface pores, reduces the permeability and increases the resistance to abrasion by dust-laden gases.

A number of the high alumina cements, described in the aluminosilicate section of this series of articles (THE IRON AGE, June 8 and 15, 1944), are used for this purpose. They are easily applied, adhere well and dry and fire without crazing or flaking. After prolonged use, however, they tend to come away from the surface bringing with them a thin layer of brick.

Better results are obtained by using a preliminary coat, like that of a finely ground sillimanite cement, followed by a second coat of coarser material. More recently mixtures of sillimanite with chrome ore (or chromic oxide) have been found to afford useful protection to high temperature insulation, particularly where the furnace gases contain iron oxide.

Applications

(a) *Theoretical:* The general theory of heat flow has been dealt with at length by a number of workers, but an excellent summary of the factors controlling heat flow, has been given by Austin in the A.S.T.M. Symposium on Thermal Insulating Materials. (See bibliography).

The definition of thermal conductivity is given by the coefficient K in the equation:

$$\frac{dq}{dz} = - KA\, dt/dx$$

where dq is the quantity of heating passing in the time dz between two parallel isothermal planes of area A at a distance dx under the temperature difference dt.

For most purposes, the equation:

$$q = \frac{A}{x} K(t_1 = - t_2)$$

is employed, but it should be noted that this takes no account of the fact that K usually varies with temperature. In practice, this difficulty is overcome by taking the value of K, corresponding to the mean temperature of the brick under consideration. This brings in the limitation that a good deal may depend on whether a mean of say 752 deg. is the mean of 1112 deg. and 392 deg. F. or of 756 deg. and 748 deg. F.

The actual value of K depends on the units chosen. These vary widely and are frequently confused. The two main standards, however, are as follows:

British thermal units: B.t.u. per sq. ft. per hr. per deg. F. diff. per 1 in. thickness.

Centimeter-gram-second: Cal. per. sq. cm. per sec. per deg. C. diff. per 1 cm. thickness.

If the result is expressed in c.g.s. units of the type given above, it must be multiplied by 2903 to convert to British thermal units.

Austin lists the factors which might have an influence on K:

(A.) *Chemical composition.*

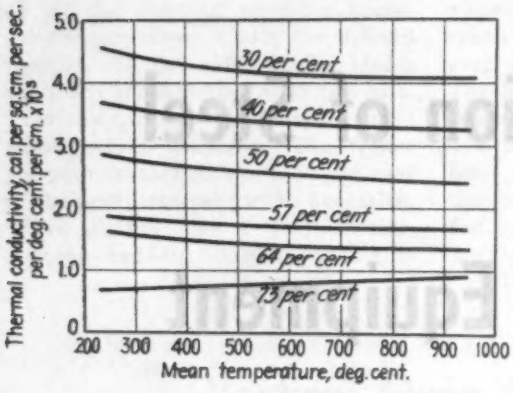


FIG. 9 — Effect of porosity on the conductivity of diaspore bricks, after Austin.

(1) Influence of molecular structure in pure compounds.

(2) Influence of impurity in solid solution.

(B.) *Physical texture.*

(1) Porosity.

(a) Total void space.

(b) Size and shape of pores.

(c) Size and shape of grains.

(2) Presence of a vitreous or liquid phase.

(a) Total amount of phase.

(b) Distribution of phase.

(3) Development of ceramic bond and sintering.

(a) Influence of time of firing.

(b) Influence of temperature firing.

(4) Anisotropy and directional effect.

(C.) *Temperature.*

(D.) *Pressure, stress or strain.*

(E.) *Heat flow.*

According to Debye and later workers, heat is transferred not only from molecule to molecule as in gases, but also by the conduction of the crystal lattice as a whole. He considered such solids to be a system of coupled resonators in which long wave oscillations are superposed on the atomic or molecular motions. It is suggested that these "thermoelastic" waves have a wave length somewhat greater than the distance between lattice points, are not purely harmonic and can be disturbed by the heat flow itself. Any distortion of the lattice such as occurs when say iron oxide is added to magnesia, will tend to decrease the conductivity by interfering with these waves. The theory is of interest in refractories, because it suggests that oxides having a relatively simple structure, magnesia, for example, should have a higher conductivity than more complex materials such as forsterite or mullite. This is borne out by direct determination.

It must, however, be remembered that the molecular structure is only one variable and hence it is possible by having a high void space to produce excellent insulating materials from such high conductivity oxides as magnesia, particularly if they are poorly crystalline, that is contain micropores in addition to those between the grains themselves.

Provided the pore size is small, the absolute size does not have much effect on the conductivity if the total porosity remains constant. Foamed refractories containing larger pores would show a higher conductivity than similar porosity bricks with small pores, because heat transfer occurs by radiation as well as by conduction. Convection can normally be neglected.

The effect of the pore size on conductivity is well brought out in Figs. 9 and 10, which show the effect of varying porosity in diaspore and silica bricks. The variation is so consistent that if the porosity of such products is known, the conductivity can be estimated within fairly close limits.

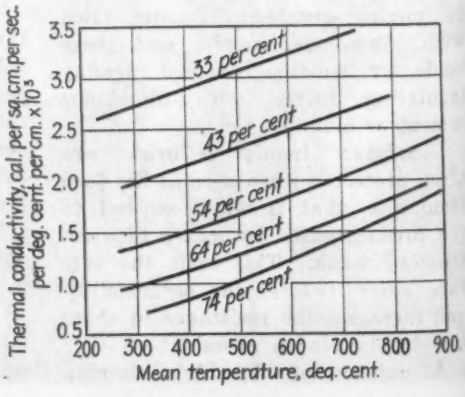
This only applies, however, to the variations normally met with in practice. Thus unfired or light fired bricks have a much lower conductivity than hard fired bricks due to the poor intergranular contact. Austin found that one unfired brick had a conductivity of 13.05 B.t.u. at 1472 deg. F. mean, but that this rose to 20.3 after firing for 24 hr. at 2462 deg. F. and to 24.6 B.t.u.'s after a much longer period at this temperature. This result is of great interest in connection with induction furnaces, where use is made of the relatively low conductivity of unfritted material to reduce the heat loss from the steel to the water-cooled coil. Where excessive sintering occurs, due for example to too high a flux content, the cooling water temperature rises rapidly, and steelmaking becomes more difficult. This fact is bound to act as a deterrent against the use of prefired bricks in induction furnace linings. Similar considerations apply with freshly rammed dolomite hearths, the depth of sinter being initially very slight due to the low conductivity of the unsintered aggregate. If finely ground aggregates are used, the conductivity is even lower, but this is partially offset by the greater sintering tendency of finely ground material of big surface area.

Directional effects are not normally found in insulating materials, though natural diatomite as mined in slab form does show markedly different properties parallel and perpendicular to the plane of lamination. Vermiculite doubtless shows a directional effect within each concertine-like grain, but in service such anisotropy is ruled out by the random orientation of the expanded mica grains.

(*b*) *Practical:* No attempt will be made in the present section to delve into the mathematics of heat loss calculations. Those who are sufficiently interested will find all they want in the books referred to in the bibliography. The refractories engineer generally short circuits such laborious calculations as are involved in a fundamental study by making use of heat loss curves for equivalent firebrick thicknesses, with varying inside temperature.

The fundamental equation behind all such devices is that *for equilibrium* (which is often not reached in practice):

FIG. 10—Effect of porosity on the conductivity of silica bricks, after Austin.



The heat loss from a given area of surface of the brickwork to atmosphere = The heat passing in the same time through an equal area of brickwork at any depth within the wall; the outer and inner areas being planes perpendicular to a common axis.

In other words, the same amount of heat leaves the outside wall as passes through the refractory brick and insulation.

If the outside temperature were known before the calculation started, then the average temperature of the brick would be determined, and the conductivity at the mean temperature could be used. The calculation of heat loss would then be a simple application of the heat conduction equation given above. Unfortunately, the outside temperature is not known in advance and hence the normal procedure is to assume some probable outside temperature, calculate the heat transmitted through the brickwork, and see how closely this agrees with that known experimentally to be lost from an outside surface at this temperature. If the agreement is not good enough, then the assumed outside temperature must be modified and the calculation repeated.

It is clear that such process can prove very laborious, particularly if the wall is a composite one, involving a number of different qualities of brick each with its own thermal conductivity-temperature characteristics.

The usual method of short circuiting the process is to convert the wall to equivalent firebrick thicknesses. Thus, in considering a wall:

	Magnesite	Fireclay	Insulation
Thickness, in.	3	3	3
Thermal conductivity, B.t.u.	25	5	1

Then the equivalent firebrick thickness would be: 3 in. x 5/25 + 3 in. + 3 in. x 5 in., or a total of 18.6 in. Use can then be made of a chart showing the heat losses and outside temperature for a wall, say 18 in. thick of fireclay brick (5 B.t.u.'s), and of the given inside temperature. This is essentially the method employed in Fig. 11, which can be used for firebrick thicknesses of up to about 50 in. and for hot face temperatures varying from 932 deg. to 3092 deg. F. This particular set of curves was worked out on the basis of a surrounding air temperature of 68 deg. F., normal convection losses and a surface emissivity 0.80 times that of a black body. Typical conductivity data are given in Figs. 12 and 13 that may be used in heat loss calculations.

If a very large number of calculations are involved, as in working out the possible arrangements of fireclay, insulating and red brick in building a checker chamber wall, then recourse may be had to some form of slide rule, like that designed by J. E. Pluck and illustrated in Fig. 14.

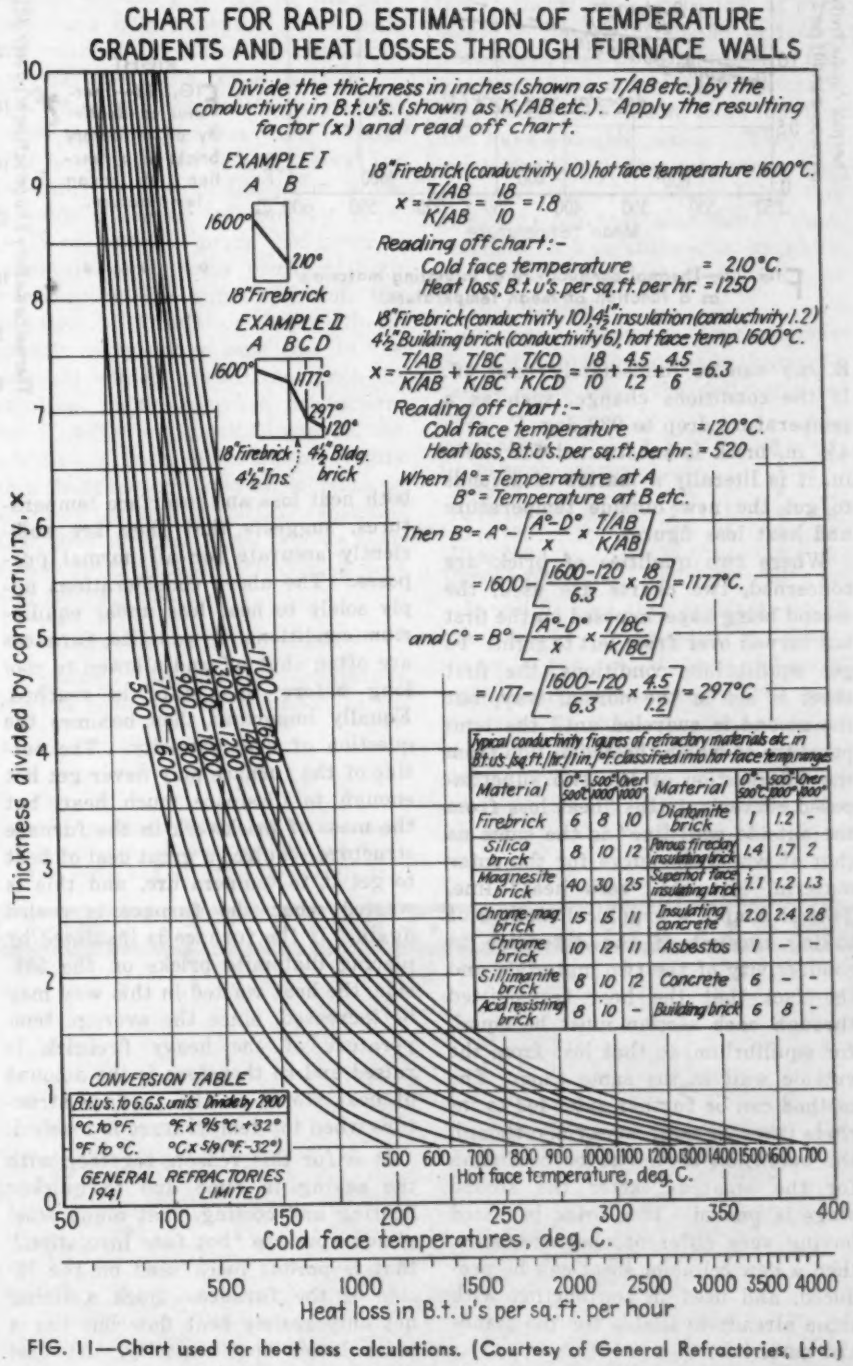


CHART FOR RAPID ESTIMATION OF TEMPERATURE GRADIENTS AND HEAT LOSSES THROUGH FURNACE WALLS
Divide the thickness in inches (shown as T/AB etc.) by the conductivity in B.t.u's. (shown as K/AB etc.). Apply the resulting factor (x) and read off chart.
EXAMPLE I
18" Firebrick (conductivity 10) hot face temperature 1600°C.
x = T/AB / K/AB = 18/10 = 1.8
Reading off chart:-
Cold face temperature = 210°C.
Heat loss, B.t.u's. per sq.ft. per hr. = 1250
EXAMPLE II
18" Firebrick (conductivity 10), 4½" insulation (conductivity 1.2) 4½" Building brick (conductivity 6), hot face temp. 1600°C.
x = T/AB / K/AB + T/BC / K/BC + T/CD / K/CD = 18/10 + 4.5/1.2 + 4.5/6 = 6.3
Reading off chart:-
Cold face temperature = 120°C.
Heat loss, B.t.u's. per sq.ft. per hr. = 520
When A° = Temperature at A
B° = Temperature at B etc.
Then B° = A° - [(A°-D°)/x x T/AB / K/AB]
= 1600 - [(1600-120)/6.3 x 18/10] = 1177°C.
and C° = B° - [(A°-D°)/x x T/BC / K/BC]
= 1177 - [(1600-120)/6.3 x 4.5/1.2] = 297°C
Thickness divided by conductivity, x
Cold face temperatures, deg. C.
Heat loss in B.t.u's per sq.ft. per hour
Hot face temperature, deg. C.
CONVERSION TABLE
B.t.u's. to G.G.S. units Divide by 2900
°C. to °F. °F. x 9/5 °C. +32°
°F to °C. °C x 5/9 (°F.-32°)
GENERAL REFRACTORIES LIMITED 1941
Typical conductivity figures of refractory materials etc. in B.t.u's. /sq.ft./hr./1 in./°F. classified into hot face temp ranges
Material | 0°-500° | 500°-1000° | Over 1000° | Material | 0°-500° | 500°-1200° | Over 1200°
Firebrick | 6 | 8 | 10 | Diatomite brick | 1 | 1.2 | -
Silica brick | 8 | 10 | 12 | Porous fireclay insulating brick | 1.4 | 1.7 | 2
Magnesite brick | 40 | 30 | 25 | Superhot face insulating brick | 1.1 | 1.2 | 1.3
Chrome-mag brick | 15 | 15 | 11 | Insulating concrete | 2.0 | 2.4 | 2.8
Chrome brick | 10 | 12 | 11 | Asbestos | 1 | - | -
Sillimanite brick | 8 | 10 | 12 | Concrete | 6 | - | -
Acid resisting brick | 8 | 10 | - | Building brick | 6 | 8 | -

FIG. 11—Chart used for heat loss calculations. (Courtesy of General Refractories, Ltd.)

This instrument consists essentially of a circular type graph drawn on a rigid base. Temperatures are marked on it radially, and heat losses circumferentially. A line can be seen on the chart giving the heat loss from wall surfaces to still air for various temperatures.

A peg is fixed at the radial center of the chart on which celluloid sheets inscribed with heat loss lines, corresponding to different thicknesses of refractory, can be fitted and rotated. As an example of its use: Let us assume that we are concerned with a 9 in. silica brick wall with a temperature inside the furnace of 2624 deg. F., then the celluloid sheet, with the 9 in. silica brick line on it, is placed in position and rotated until this line intersects the "zero heat" line on the left at 2624 deg. (as photographed in Fig. 14.) If now the point is noted where the 9 in. line crosses the "heat loss from outside wall surface to air" line, then the outside temperature, 572 deg. F. and the heat loss (2380

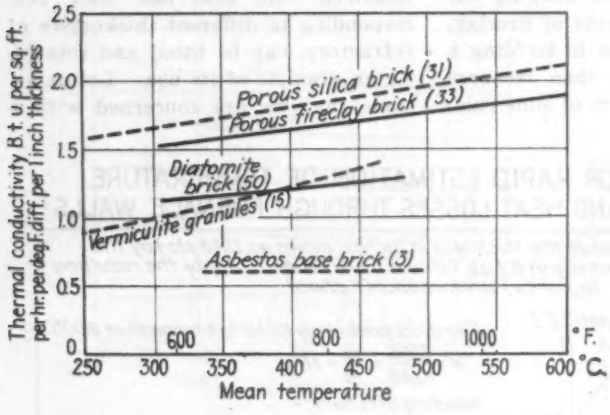
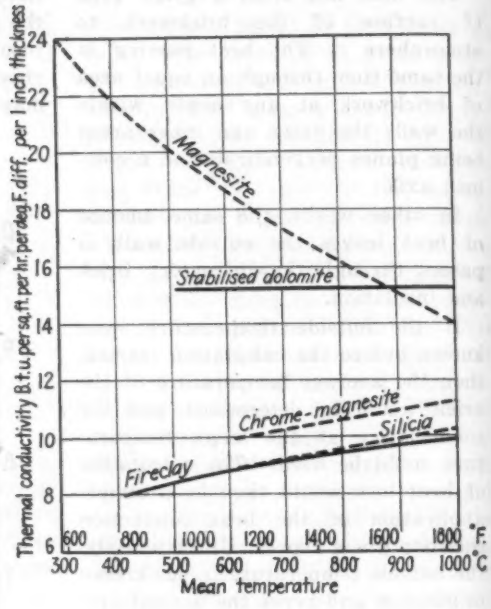


FIG. 12—Thermal conductivity of insulating materials as a function of mean temperature.

RIGHT

FIG. 13—Thermal conductivity of refractory bricks as a function of mean temperature.



B.t.u.) can be immediately read off. If the conditions change, such as a temperature drop to 932 deg. F., or a 4½ in. brick is substituted for the 9 in. it is literally a matter of seconds to get the new outside temperature and heat loss figures.

Where two qualities of brick are concerned, two charts are used, the second being superimposed on the first but turned over from left to right. To get equilibrium conditions, the first sheet is set in the normal way, but the second is swiveled until the temperature at which the radial line from the intersection of the two superimposed curves cuts the "heat loss from the outside wall line" is the same as that at which the curve for the outer material hits the "zero heat" line. This is simply a graphical method of taking account of the difference in conductivity of the two materials and the fact that the heat transmitted through each section must be equal, for equilibrium, to that lost from the outside wall in the same time. The method can be further extended to include three or more materials, though the operation begins to be confusing for the amateur, after the second stage is passed. If a brick is tested having very different characteristics, then a new celluloid sheet can be produced, and used in conjunction with those already available for the standard materials.

The importance of such calculations lies not only in being able to estimate probable heat saving as a result of insulation but in being able to say whether an insulating brick in a composite wall is likely to be above its maximum safe temperature. Thus in a checker installation, it is usually necessary to change from low temperature to high temperature insulation about two-thirds of the way up the wall. Such experience as has been gained with the application of these rapid methods of estimating both heat loss and interface temperatures, suggests that they are sufficiently accurate for all normal purposes. The above considerations apply solely to heat loss under equilibrium conditions. In practice, furnaces are often shut off and allowed to cool long before this state is reached. Equally important then becomes the question of heat capacity. The outside of the furnace may never get hot enough to dissipate much heat, but the mass of brickwork in the furnace structure requires a great deal of heat to get it to temperature, and this is wasted when the furnace is cooled again. If the furnace is insulated by placing diatomite bricks on the outside, the heat wasted in this way may be increased, since the average temperature of the heavy firebrick is raised and so therefore is the amount of heat stored in the furnace structure when top temperature is reached.

It is for this reason, together with the saving in time due to quicker heating and cooling, that many steel plants now use "hot face insulation," that is porous brick used on the inside of the furnace. Such a lining not only resists heat flow but has a much lower heat capacity. At first it was thought to be extremely dangerous to build even low temperature reheating furnaces from such friable material, but experience has shown that where they are not subjected to abnormally dirty conditions, impact or vibration, they stand up well and lead to considerable economies. Such furnaces have been used for a long time in the U. S. by Babcock & Wilcox for example, for annealing boilers, and have proved their usefulness beyond doubt. Even in furnaces where the conditions are much less favorable, trials are worthwhile, particularly if accurate fuel records can be kept so that fuel savings can be balanced against probable increases in brick costs. The light weight of such a structure greatly simplifies furnace construction and many furnaces have now been partially prefabricated by suspending the bricks in panels and attaching these to the steel frame of the furnace.

A good deal of optimism is found in the literature with regard to the saving resulting from insulation, but there is no doubt that losses through furnace brickwork are considerable, and that savings of the order of 10 to 20 per cent may be expected from the insulation of open hearth and reheating furnaces. The point that must be continually borne in mind is that insulation represents as much a change in furnace design as say, alteration of port size or checkering. Such changes should always be considered in relation to the furnace as a whole.

Thus insulation of open hearth checkers, although generally advisable may, in extreme cases, have the effect of raising the stack temperature, with consequent damage to valve gears, without any obvious net gain in fuel efficiency. Similarly, insulation of an open hearth furnace roof without regard to the rest of the furnace may mean a slowing up in production, since the gas input must be reduced if melting of the roof is not to occur, and reduced gas input means a drop in the amount of heat imparted to the charge by flame impact.

There is still room for considerable research on open hearth and reheating furnace insulation but, to be use-

ful, it must go hand in hand with design, and this means much more accurate data on the mechanism of heat transfer in furnaces than are at present available. Thus, it is only comparatively recently that answers have been given to such fundamental questions as: Can the fully melted bath of an open hearth furnace ever be hotter than the roof? Most melters will agree that it is all too easy to get the roof hotter than the bath.

Insulation Effect on Refractories

It has been stated that the insulation of open hearth furnace roofs leads to improved roof life and Harvey has given excellent reasons as to why this may be so. It should be noted, however, that most of the complete insulation jobs have been done in conjunction with roof pyrometry and since roof pyrometry alone often leads to better roof life, it is difficult to say whether the insulation as such has had much effect. One thing is certain, namely, that an insulated roof is much more liable to excessive running if overheated, since the amount of additional heat that must be supplied to melt away, say the first 2 in., is much less than with an uninsulated roof.

With front and back walls, there is again much difference of opinion. Water cooling and insulation are often used close together on the same furnace, and it hardly seems reasonable to justify both procedures in terms of improved performance of the refractories. Every position must be judged on the precise operating conditions, including design of the furnace, and only repeated trials with and without insulation can be taken as a reliable basis for a decision.

With open hearth bottoms, over-insulation can have disastrous effects. The hearths of British furnaces are generally very thin, the 12 in. thick dolomite monolith standing on 9 in. to 12 in. of basic brick. In general, magnesite or dolomite bricks of high conductivity are employed, and the addition of insulation below these, greatly reduces the heat loss to the pan. It will be argued that such insulation should increase production, but if, as in one specific instance, the addition of 3 in. of insulation results in a "soft bottom" and an increase of about 50 per cent in fettling consumption, then the heat saved is more than offset by increased refractories cost and fettling time.

Anti-Piping Compounds

Although anti-piping compounds are not commonly looked upon as insulating materials, they definitely function as such, and, in addition, supply heat of combustion to the molten metal.

For many years, it has been custom to throw ashes, coke dust or even straw on the top of ingots to reduce heat losses and thus reduce pipe formation. The anti-piping materials used today are much more efficient and have a double action: They are insulators by virtue of their high porosity (usually obtained by fine grinding) but they also contain combustibles such as anthracite, graphite, cork and sawdust, which give off heat when they burn.

Grading: Tests on four commercial anti-piping compounds, having a carbon base gave the following results:

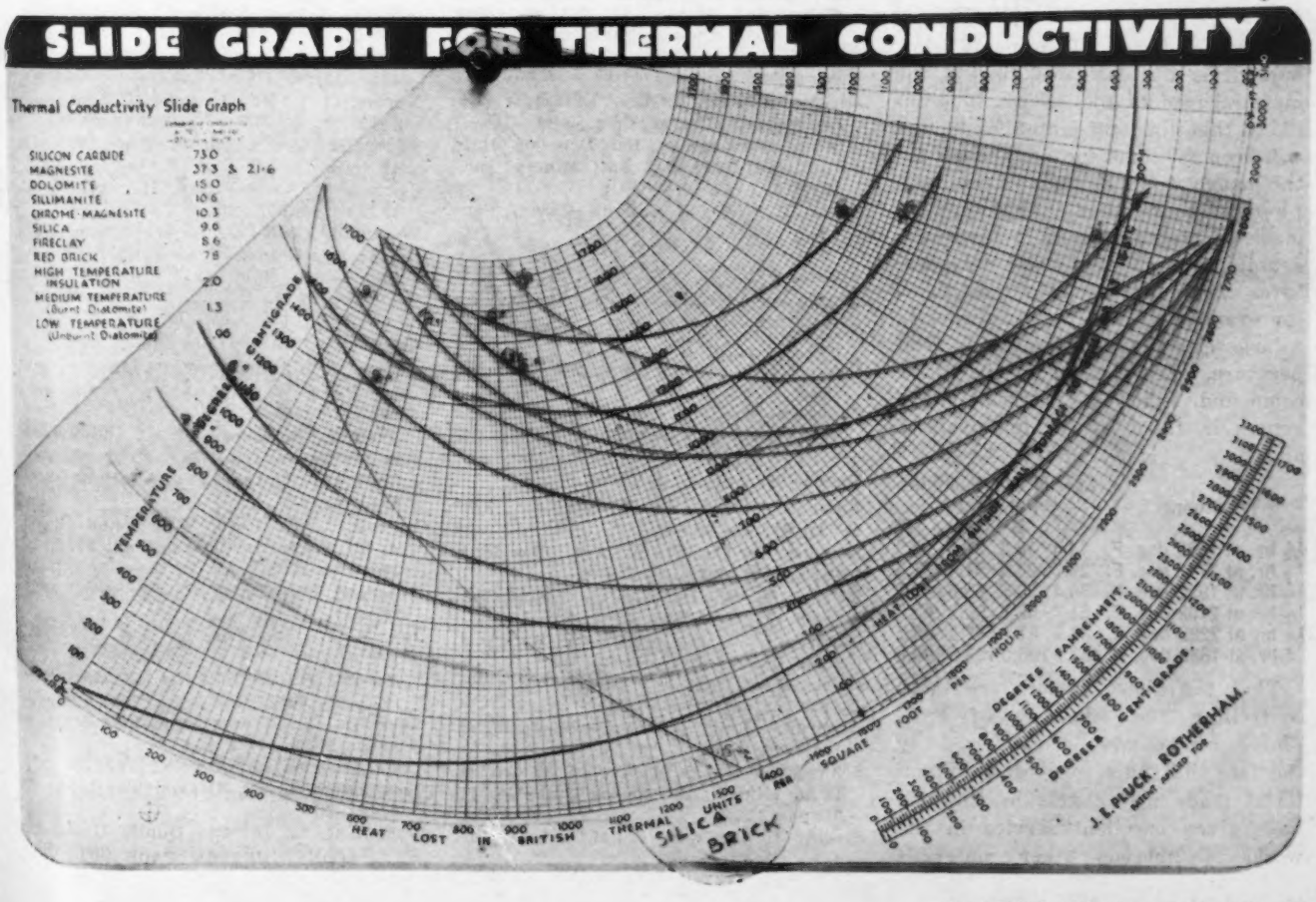
B.S.I. Mesh.	A	B	C	D
On 25 mesh, per cent	..	..	1	..
25 to 72	..	1	4	..
72 to 100	2	1	4	4
100 to 150	3	4	10	12
150 to 200	15	12	15	9
Through 200	80	82	66	75

It will be seen that brand A, which was one of the pioneer materials, shows 95 per cent through 150 mesh.

Thermal Conductivity: The conductivity of these powders was obtained by pouring them into a brick-shaped well in the low temperature conductivity apparatus described for use with insulating bricks. It will be

o o o

FIG. 14—Pluck slide graph for the determination of heat loss through furnace walls and interface temperatures.



seen from the data given below, that their conductivity at 932 deg. F. mean is of the same order as that of a diatomite brick, that is they are quite good insulators apart from their ability to yield heat by combustion.

Material	Thermal Conductivity B.t.u.	Packing Density Grams Per C.C.	Lb. per Cu. Ft.
A	1.38	0.66	41.3
B	1.37	0.65	40.6
C	1.00	0.61	38.1
D	1.07	0.59	36.9

Melting Point of Ash: At first, the effect of an anti-piping compound is largely one of insulation, but gradually it begins to burn and because of the insulating blanket above, most of the heat enters the steel. As it burns, the carbonaceous material leaves an ash, and if this too is to have an insulating effect, it is desirable that it should remain as a skeleton and not melt to form a glassy pool that runs into the pipe. The data obtained on the above anti-piping compounds were:

Material	Melting Point of Ash, Deg. F.
A	2399
B	2399
C	2399
D	2480

Combustible content was determined by loss on ignition and was found to be:

Material	Content of Combustibles, Per Cent
A	63.8
B	68.3
C	50.3
D	58.6

Burning Rate: Reasonably slow burning is also desirable, since if the material rapidly goes to ash, it is unlikely that the anti-piping compound will keep the ingot top hot enough for the hour or so needed to minimize piping. Tests should therefore be made of weight-loss after firing for definite periods at definite temperatures under reproducible conditions, for example, in small silica dishes in a large electric furnace at even temperature. Tests made on the above compound, showed marked divergences in favor of the materials A and B:

Treatment	Loss of Combustibles, Per Cent A	B	C	D
½ hr. at 1562 deg. F.	14.4	16.2	30.8	22.9
½ hr. at 1742 deg. F.	26.7	28.8	51.4	37.6
½ hr. at 1922 deg. F.	36.4	36.5	68.0	47.1
½ hr. at 2102 deg. F.	51.7	52.0	83.2	62.8
½ hr. at 2282 deg. F.	86.5	87.1	97.5	95.7
4 hr. at 1832 deg. F.	100.0	100.0	100.0	100.0

That the above factors are those controlling the efficiency of anti-piping compounds, is supported by the fact that numerous types of material made up on this assumption, have given excellent service in the works. Numerous other materials have been used, such as ceramic coated cork, and carbonaceous materials containing powdered aluminum, but the same principles apply, that is heat insulation by fine grinding or the use of a material like cork, that is inherently an insulator due to its porous nature, together with heat generation by oxidation of some constituent.

One word of caution is perhaps required, namely that a material may fulfill all the above requisites and yet be unserviceable because of its tendency to carburize or increase the sulphur in the ingot head. For this reason, trials of anti-piping compounds in the works usually end with a sectioning of the ingot head and the taking of a sulphur print and samples for analysis.

Acknowledgments

In conclusion, the author desires to express his thanks to Dr. T. Swinden, Central Research Department, the United Steel Companies, Ltd., for permission to publish this article and to his various colleagues in the steel and refractories industries for their constant collaboration.

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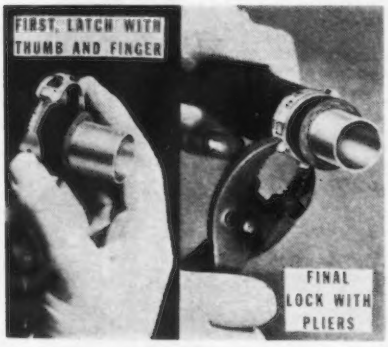
(CONTINUED ON PAGE 90)

New Equipment . . .

Plant Service

. . . Recent developments in clamps, lighting, lettering machines, dust collectors, safety goggles and miscellaneous accessories for the metal working shop are described in the following pages.

A ONE-PIECE hose clamp which uses no gears, thumb screws or intricate locking means has been developed by *Tinnerman Products, Inc.*, 2040 Fulton Road, Cleveland 13. It may be snapped over the hose into pre-latched position by hand and final lock made with ordinary pliers. Constructed for lower pressure connections, the clamp has a lower profile, is lighter in weight and exerts an even



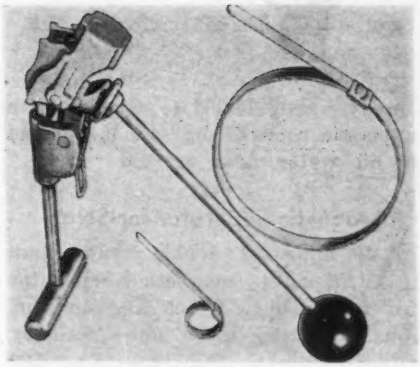
pressure around the entire circumference of the hose. Made of SAE 1060 spring steel with parkerized and zinc chromate primer finish, it is available for all sizes of AN and Ordnance specification hose in wide range from ½ in. o.d. up.

Coupling for Metal Hose

A DETACHABLE brass coupling for helical flexible metal hose in sizes from ¾ to 1½ in. i.d. has been developed by *Packless Metal Products Corp.*, New Rochelle, N. Y., offering the advantage of being mechanically self-sealing. The unit consists of only four parts—the nut, back, stem and split ring. When assembled the convolutions of hose and the metal braid are securely held by pressure between the members. The coupling withstands pressure tests up to 800 lb.

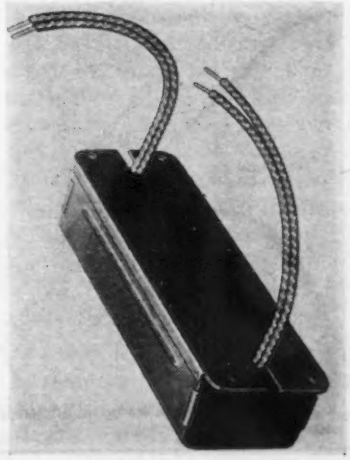
Hose Clamp Tool

HOSE clamps available from ¾ to 48 in. i.d. for banding, clamping or splicing have been announced by *Punch-Lok Co.*, 321 North Justine Street, Chicago 7. In making the connection, a flat, high tensile-strength galvanized steel band is double wrapped around the joint. After tensioning with a pull of 1000 lb. within the Loking tool, the ends are securely locked together under tension within the flat pressed-steel clip and the excess band cut off flush with the clip so that the entire joint is streamlined for safety.



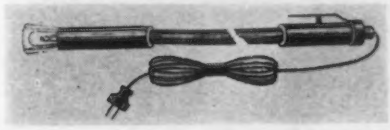
Ballasts

A HIGH-VOLTAGE ballast for the operation of 40-watt instant-starting fluorescent lamps has been announced by *General Electric Co.* The Tulamp ballast applies 450 volt to the lamp at starting, striking an arc between the lamp cathodes, thus eliminating the need for separate starter equipment. The ballast is available for use on 118-volt circuits, and delivers rated watts to the lamp at nominal circuit voltage. This design provides high power factor and gives correction of cyclic light flicker. Special radio filters are incorporated.



Inspection Light

A LIGHT designed for inspection of shells, barrels, forgings, etc., which consists of a small standard 110 volt bulb mounted in a 30 in. or longer tubular handle with 6 ft. extension cord has been announced by *Trimount Instrument Co.*, 37 West Van Buren Street, Chicago. The light bulb is protected by a plastic guard. The 30 in. model is standard for internal inspection of 8 in. shell forgings both before and after machining. These units are available in both non-vaporproof and explosion-proof models.



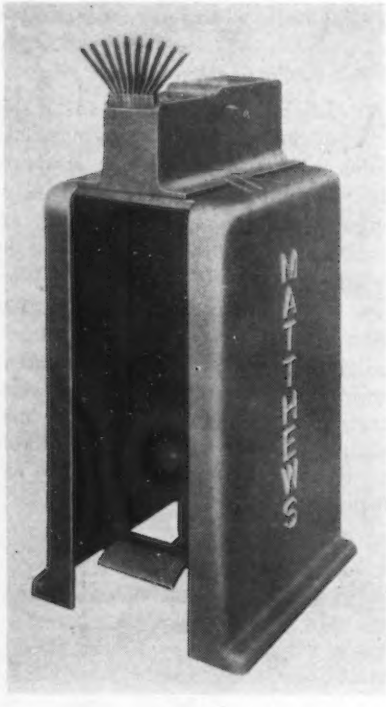
Electric Lettering Machine

A MACHINE for lettering engineers' drawings has been announced by the *Elliott Fisher Co.* The machine is equipped with a completely electrified standard typewriter keyboard, the keys of which may be adjusted to produce lettering of any desired density. The density is further assured by a new blueprint ribbon made especially for this type of drafting work. The writing surface of the machine is the Elliott Fisher flat platen which allows 396 sq. in. of the drawing to be in full view and in lettering position at all times. Descriptions may be typed, with pinpoint accuracy at any location within

this area and in cases of very large drawings new areas may be quickly moved into typing position.

Tag Embosser

METAL tags for identification purposes can be quickly embossed with the new "Quick-Set" embossing machine developed by *Jas. H. Matthews & Co.*, Pittsburgh. The machine will accommodate either coiled sheet metal strips or tags already cut to size. It can be furnished in the floor model (illustrated) or in a bench model. Manufactured to order, the machine can be supplied to emboss as many as 16 characters at a time, from 3/16 to ½ in., with each embossing bar limited to maximum of 13 characters.



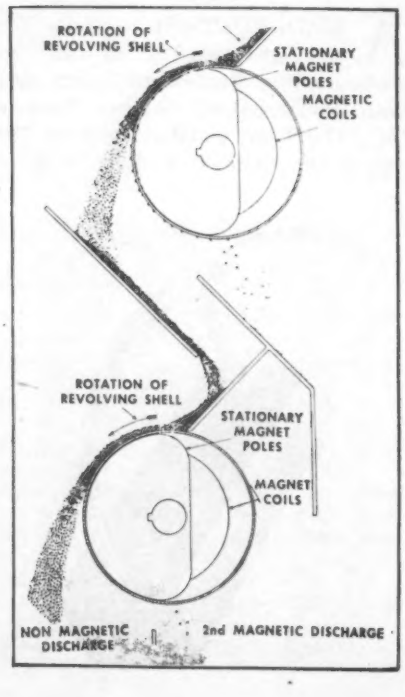
Visible Level Lubricator

AN automatically controlled visible oiling method for most types of bearings is offered by *Oil-Rite Corp.*, Milwaukee, 7, Wis. In the base are a bottom and side outlet for connection to the bearings, either or both of which may be used. In the center is a large air intake opening which can be connected to a filter if necessary or to a breather tube on the bearing. The oil level is clearly marked on the outside. The dome maintains the oil level at its lower edge and acts as a stopper or valve to prevent spilling of oil in filling or removing reservoir. The reservoir provides visible means of checking oil

supply. It is sealed to a collar with a plastic cement and is not affected by oil, water, heat, or acid.

Magnetic Separator for Scrap

AN improved double drum, high intensity magnetic separator for separating ferrous and non-ferrous scrap has been announced by *Dings Magnetic Separator Co.*, 509 East Smith Street, Milwaukee 7. The principle of operation, indicated in the accompanying diagram, features high temperature windings on the coils which are said to withstand flaming hot aluminum chips. Outboard bearings are used on the drum shafts for easy inspection and removal. Either drum can be removed without dismantling the entire separator. Capacity of the 24 in. width model is approximately 5000 lb. of aluminum bearings per hr.

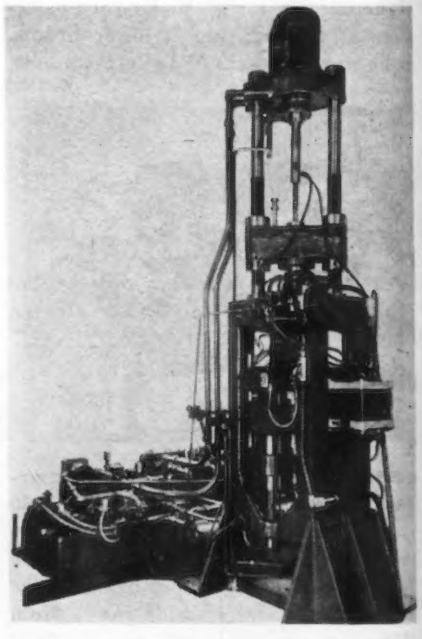


Magnetic Floor Sweeper

A PORTABLE, light scrap picking magnet for use on factory floors or similar surfaces is announced by the *Stearns Magnetic Mfg. Co.*, Milwaukee 4. The unit consists of a permanently magnetized drum mounted on a convenient chassis having anti-friction bearings throughout. The drum revolves with an 18 in. working face.

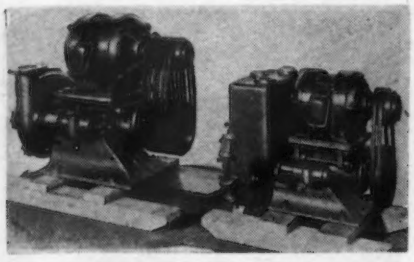
Injection Molding Machine

AN injection molding machine for plastics, capable of multiple operations, has been announced by the *Lester Engineering Co.* for Lester-Phoenix, Inc., 2711 Church Avenue, Cleveland 13. The injection molding of thermoplastic materials is accomplished in the same manner as in the standard Lester horizontal injection



machine, with a vertical cylinder, using a hollow plunger, the usual right angle delivery now being unnecessary. The injection molding of thermosetting material and rubber can be done by either jet injection of granular material or plunger injection of electronically heated preforms. Choices between the two depends upon the weight and size of castings. In the injection of electronically heated pre-forms, the cylindrical plastic or rubber preforms are placed between electrostatic plates of a high frequency generator. In both jet molding and injection of electronically heated preforms, the cycle time is reduced to a fraction (ranging from ½ to 1/50) of that required by previous methods. The machine shown is self-contained,

having a 30 hp. motor, hydraulic equipment and electric timing controls on a separate base.

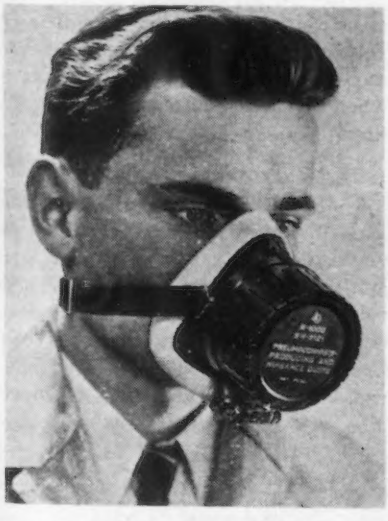


Centrifugal Pumps

AMSCO-NAGLE centrifugal pumps of the horizontal type are now available with the motor mounted overhead according to an announcement by *American Manganese Steel Div. of the American Brake Shoe Co.*, Chicago Heights, Ill. Among the advantages this arrangement is said to offer are operation of pump at more accurate speeds, speed changes provided if called for, motor stationed at a more accessible point and at the same time protected against flooding.

Respirator

TO protect workers against certain dust, fume and gas hazards, the *American Optical Co., Southbridge, Mass.*, announces that its



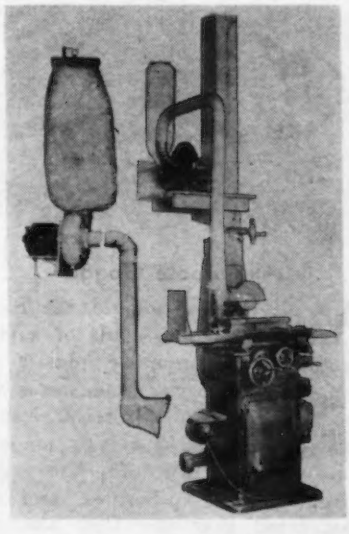
R-1000 respirator is now being equipped with knitted cotton facelets. The AO facelets are soft against the skin, absorb perspiration, are washable and fit most standard design respirators.

Dust Collection Units

A LINE of bag type portable dust collection units ranging from 300 cu. ft. per min. and having up to 8 in. static pressure at the fan has been put on the market by *Northern Blower Co.*, 6502 Barberton Avenue, Cleveland 2. Norblo portables are designed for light dust loads and intermittent service and are equipped with ¾ to 3 hp. motors. The bags are cleaned by hand shaking. For wet or moist grinding or polishing or where lint or fibrous fabric is produced a new line of Norblo impingement and filter type small units is available ranging from 500 to 1000 cu. ft. per min. with 8 in. static pressure at the fan.

Dust Collector

AN individual dust collector that handles 600 cu. ft. per min. with a ¼ hp. motor at 3500 r.p.m. has been announced by *Leiman Bros.*, 144-75 Chrystie Street, Newark. The col-



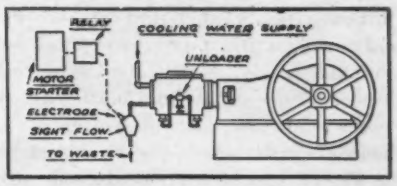
lector is 47 ft. high and has a 9 in. diameter dust bag, 3 in. pipe and elbows and can be run from any electric light socket.

Air Cooling Unit

A COMPACT safety valve air cooling unit, or after cooler, for removing condensation from the air line and reducing the temperature of the compressed air has been announced by *D. J. Murray Mfg. Co.*, Wausau, Wis. The unit will operate in cooperation with the discharge line of any air compressor. It may also be used as an interstage cooler for multiple stage compressor systems. The "fin" sections are made of high-test cast iron.

Compressor Control

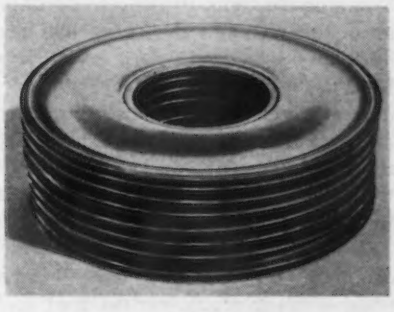
A CONTROL for water-cooled compressors designed to prevent overheating and waste of water has been announced by *Johnson Corp.*, Three Rivers, Mich. By permitting the compressor to operate only when water is actually flowing through it,



this control guards against failure of water supply from any cause whatsoever and consequently permits the use of automatic water cut-off valves. The control consists of a flow fitting, mounted in the water discharge pipe of the compressor which serves as a holder for a metal electrode. When the pressure in the receiver falls below the predetermined level, the pressure switch on the receiver opens a solenoid controlled valve to admit cooling water to the compressor. The compressor is not started until water flows through it and into the sight flow, completing the circuit with the electrode. If for any reason water supply fails, the compressor will not be started or if operating, will be stopped immediately.

Metal Bellows

METAL BELLOWS for special operating conditions are designed and produced by the *MetaLastic Div., Cook Electric Co.*, 2700 Southport Avenue, Chicago. These



bellows can be manufactured up to 72 in. inside diameter and some have been produced to withstand temperatures as high as 1500 deg. F. They can be made in a large variety of metals. Atomic hydrogen welding provides means of overcoming heat, corrosion, and porosity of joints. Provisions are also made for abnormal travel ranges and lateral deflections, vibration factors and internal turbulence, also heavy duty service as imposed by shock or surge.

Steel Plates

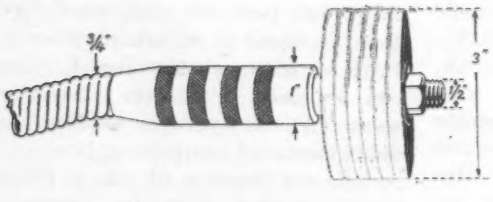
A NEW heater for heavy duty applications in industrial heating, air conditioning, vapor absorption,

drying and other processing work has been announced by *B. F. Sturtevant Co.*, Hyde Park, Boston, Mass. Each finned pipe is anchored at one end only, permitting pipes to expand and contract freely, independently of each other. Pipe alignment plates at extreme end, and also at center of all heaters with pipe lengths in excess of 6½ ft. insure correct spacing, prevent sagging and assure uniform air flow. All heaters are subjected to a 600 lb. hydrostatic test and to 200 lb. under steam. Heaters will be tested at 1000 lb. hydrostatic pressure if requested.

Above: Complete unit. Right: Cross-section showing header and inner tube construction

Boiler Tube Brush

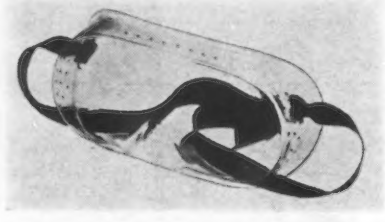
A BOILER tube cleaning device consisting of six steel-bristled brushing sections or wheels spinning as a unit through the tubes has been developed by *Osborn Mfg. Co.*, Cleveland. The equipment consists of a power-driven flexible shaft on which is mounted six 3-inch brushing sections packed with 33 gage crimped wire and held in position on the shaft by a special locking arrangement. The thousands of wire ends which comprise the working face of the brushes clear away carbon and soot.



Small-Size Eyecup Goggle

A SMALL-SIZE eyecup safety goggle for women chippers has been announced by *American Optical Co.*, Southbridge, Mass. The goggle is fitted with clear flat Super Armorplate lenses. Each eyecup is designed individually to fit the orbit of the eye. The goggle is low set for

wide angle vision, has an adjustable insulated ball-chain bridge and an adjustable headband.



All Purpose Goggle

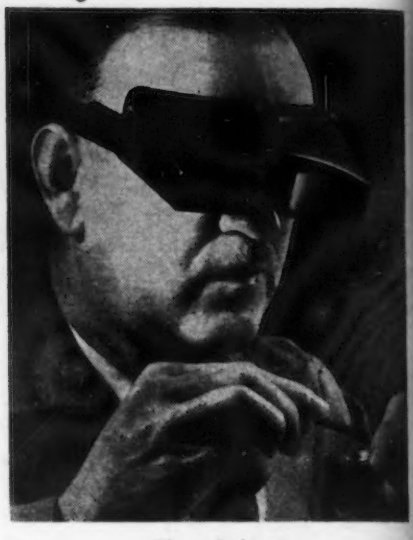
AN all purpose goggle, the Saf-I-Shield goggle, made of a clear crystal non-inflammable plastic has been announced by *United States Service Co.*, 21 West 10 Street, Kansas City 6, Mo. The goggle is made in lucite and also in acetate. The goggle is treated with "No-Scratch" and is so constructed that the lens does not touch the surface when placed on the table.

Plastic Single-Lens Goggle

AN all plastic single lens goggle, designed to provide high impact strength and unobstructed vision has just been announced by *Willson Products, Inc.*, Reading, Pa. The Willson Mono Goggle weighs 1¼ oz., has a replaceable, non-shatterable, crystal-clear plastic lens and can be worn over all types of prescription glasses.

Magnifiers

A COMBINATION eyeshield and lens mount of binocular headbound magnifiers molded of Tenite, a shatterproof, dirt resistant plastic, is being manufactured by *Carl Zeiss, Inc.*, New York City, for high precision and inspection work. The headband is adjusted by a lockscrew to fit the head. The shield cuts out stray light or side glare. Tenite is a product of *Tennessee Eastman Products*, Kingsport, Tenn.



Floor Wax

A FLOOR wax, Grip Wax, that can be sprayed on large floor areas leaving a high-gloss non-slip finish without buffing is announced by *Turco Products, Inc.*, 6135 South Central Avenue, Los Angeles 1. A free flowing liquid, the wax sets in a few minutes to a non-tacky, lustrous finish. The anti-skid qualities of the material are said to insure secure footing on all types of floors. There is no solvent action on asphaltic tile, rubber or linoleum which are ordinarily subject to rapid deterioration when treated with other types of liquid wax.

Protective Cream

A SMOOTH white cream which disappears into the skin and prevents the penetration of grease, paint and dirt into the pores is a new development announced by *Turco Products, Inc.*, 6135 South Central Avenue, Los Angeles. Solu-Glov is used like a vanishing cream, and dries to form a film to which paint, cutting oils or dirt adhere, all of which can be rinsed off in water.

Industrial Gloves

GLOVES made from synthetic material which is grease and oil-resistant and claimed to have the resistance of natural rubber to acids are now being manufactured by the *B. F. Goodrich Co.*, Akron. One style glove is lightweight type of 0.15 in. material and the sizes, in halves, range from 7 to 11, inclusive. Another style glove of 0.30 material is 14 in. in length and comes in sizes 10, 10½ and 11.

Giant rubber-pad Airplane press uses Oilgear Fluid Power for all motions. Tables travel up to 3 feet per second yet accelerate and decelerate without jar. All functions together with selective sequence obtained simply with standard equipment. Tables can be brought under press as loaded. No waiting, no delay. Proved dependable trouble-free performance.

ARE YOU TRYING TO:

1. Apply large forces through long . . . or short . . . strokes at variable speeds?
2. Obtain automatic work cycles, variable speeds in either direction . . . with or without pre-set time dwell?
3. Apply large forces through continuous or intermittent reciprocating cycles at constant or variable velocities?
4. Obtain extremely accurate control of either position or speed of a reciprocating member?
5. Apply accurately variable pressure either static or in motion?
6. Closely synchronize various motions, operations or functions?
7. Apply light . . . or heavy . . . forces at extremely high velocities through either long or short distances of travel?
8. Obtain continuous automatic reversing drives at constant R.P.M. or over a wide range of speed variation?
9. Obtain accurate remote control of speed and direction of rotation, rates of acceleration and/or deceleration?
10. Obtain constant horsepower output through all or part of a speed range?
11. Obtain automatic torque control?
12. Obtain accurately matched speed of various rotating elements?
13. Obtain constant speed output from a variable speed input?
14. Obtain full pre-set automatic control, elimination of problems of shock, vibration, etc.?

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Plane part plant after plane part plant is converting to these new Oilgear-powered 2½-, 3-, and 5-thousand-ton presses . . . selective or sequence loading and feeding on the 4-way shuttle tables are cutting down press non-productive time and boosting output tremendously. Oilgear's role is to provide the flexible, controllable power that makes such operations possible.

Sheet metal to be formed and dies are set up on table unsecured, the table accelerates smoothly so as not to disturb the set-up, travels as high as 3 feet per second, decelerates without jar under the rubber-pad press, and, after the forming operation, withdraws, its place taken by another loaded table. All operations are controlled automatically and remotely. Yet sequence can be varied at will to let tables feed under the press as fast as they are loaded, and all functions are obtained with simple, standard Oilgear equipment.

Flexible, versatile, adaptable Oilgear Fluid Power offers many other advantages too, all of them applicable to giant and midget machines alike. Forward-looking builders and users of machines and processes cannot afford to overlook these advantages. Find out from Oilgear engineers what Oilgear can do for you. Write today. . . . THE OILGEAR COMPANY, 1303 West Bruce Street, Milwaukee 4, Wisconsin.

OILGEAR

Fluid Power

Assembly Line . . . .

STANLEY H. BRAMS

• Decentralization of the auto industry will continue slowly in the postwar period, as in the past . . . General Motors and Ford are the most likely builders of new plants, primarily in Northeast quarter of the country.

DETROIT—Planning for the resumption of automobile production is quite definitely in the active stage. Along with this reconversion detailing is a fair amount of long-range thinking which, although still rather unsettled, is bringing to the fore once again the possibility of more decentralization of the passenger car industry.

The auto makers were decentralizing for many years before the war, and the movement was preceptible although it was in ultra-slow motion. Analysis of the situation as it prevails today indicates that the postwar period will see this trend continued, at about the same speed as in the past.

One big reason will naturally be the very unsatisfactory labor situation which has grown up in Michigan plants, particularly those near Detroit. Less and less work for more and more pay has become the standard of performance, and obviously this cannot continue indefinitely. One executive who has been supervising a plant in the Gulf area said the other day: "My company certainly wants to keep on operating down there. Not only does a good market exist for our product, but those people down there like to work. We get an honest day's performance from them."

In partial balance to the tendency to move away from Detroit and Michigan because of poor labor conditions is the noteworthy fact that production know-how exists around the heart of the auto business as nowhere else. Know-how in the shops is of tangible value in manufacturing operations, just as it is in the engineering and administrative departments.

To this criterion of manufacturing locals must be added others, and they point to the logic of branch plant establishment mainly in the Northeastern quarter of the country, east of the Mississippi, north of the Ohio. Because this is where the great automobile market is concentrated (44 per cent of total auto registrations are in states in this area) distribution costs command that most assembly work be done within the section. Branch plants in the deep South or on the West Coast serve a purpose in filling the requirements of their geographical sections, but until a larger percentage of the automobile market is spread into those areas, such operations are likely to continue thin.

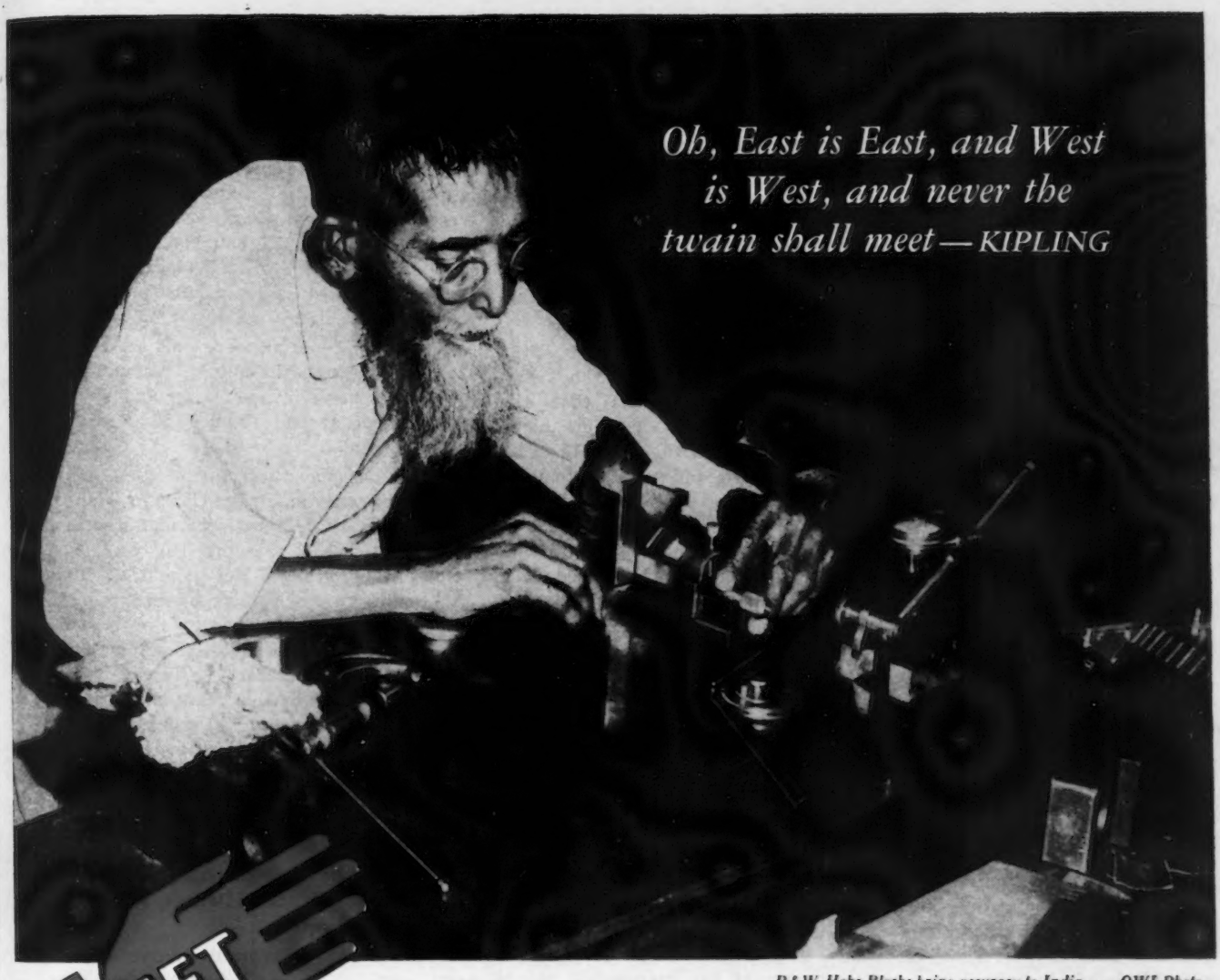
So too with raw materials. Steel mills are most convenient to Northeast quarter automobile plants; so are aluminum and magnesium smelters.

GENERAL MOTORS CORP. is developing the industry's most ambitious plans for postwar expansion. Top officials have publicly said on several occasions that plans are in the making for 10 new plants. Conceivably, one or two DPC plants might be bought by the corporation if the price is right, but there is comparatively little enthusiasm over this prospect in GM administrative circles; they feel most of the government buildings are in the wrong location or are unsuited to automobile production.

One new General Motors plant may well be in the Cincinnati area, despite controversy by nearby property owners over the site originally chosen there. Initial publicity on this location indicated that the plant would be a Fisher division unit.

Probably if this does become a Fisher plant, it will not be the only one in the new program. Sheet metal capacity in peak periods, like spring, has always been a touch-and-go matter with General Motors, and it would be logical to anticipate expansion of such facilities in view of the augmented motor market heralded by company officials. Hardware output,

WINCHES ON PARADE: *At Detroit, these winches drawn up in parade formation outside a plant of Gar Wood Industries present a dramatic contrast of light and shadow. Winches and cranes by the hundreds of thousands have been turned over to the Army.*



P & W Hoke Blocks bring accuracy to India. . . . OWI Photo

MEET MOHAMED ELLAHI BUKHSH

No, Mr. Kipling, this picture was *not* taken in the modern factory of a Western industrial nation. It is India . . . a new and progressive India which is proving that East and West *can* meet, and get along famously. The workman here is Mohamed Ellahi Bukhsh, 62, an expert with precision tools in a large Indian armament plant . . . one of many such plants equipped with the finest, most up-to-date American machines and tools.

Here, though halfway around the world in a country taking its first industrial "steps," accuracy is not a hit-or-miss proposition. For example, here on the job with Mohamed Bukhsh are the familiar Pratt & Whitney Hoke Precision Gage Blocks, a basic, unchanging standard of measurement guaranteed to be accurate within five millionths of an inch.

Today, there are no geographical limits for accuracy. Mohamed Ellahi Bukhsh and thousands of newly-skilled workers like him all over the world are daily depending on Pratt & Whitney machine tools, small tools, and gages—on P&W's 84-year background as masters of *basic accuracy for mass production*. They are discovering what Western manufacturers have known for years—that Pratt & Whitney products are built to one rigid standard of accuracy which never changes.

PRATT & WHITNEY

Division Niles-Bement-Pond Company

WEST HARTFORD 1, CONNECTICUT

which comes under the Fisher bracket, also was tight at heavy production periods, so some expansion could be expected in that direction.

Anticipations can be logically drawn on the score of other plants to be built my GM. Chevrolet, for example, has been able to meet sales requirements at all but the very biggest production periods, so it would not be likely to expect more than one or two new Chevrolet plants at the outside, and it might well be that one of these would be at Buffalo, where the erstwhile motor and assembly operations were completely, almost irrevocably transformed by conversion to aircraft engine production.

More likely as nominees for expansion are the Buick, Olds and Pontiac Divisions of the company, and, in fact, it is definitely known that one plant for the assembly of these units will be erected on the West Coast, either as a replacement for the formerly used Southgate Los Angeles plant or as a new operation in San Francisco. Southgate is still owned by General Motors but was leased to Douglas and is completely converted.

Buick, Olds and Pontiac cars were formerly assembled at their headquarters plants in Michigan, at Southgate and Linden, N. J. Those facilities were all definitely limited, and during the all-time high production rates of the three divisions during the immediate prewar years their facilities were creaking with the load. It is a good bet to anticipate that branch plants other than the new one on the West Coast will be built either as combined Buick, Olds and Pontiac operations or as individual plants for single divisions.

IN planning for the future it is quite obvious that the Ford Motor Co. faces considerable shuffling in its production. Ford had 34 manufacturing plants on automobile work before the war, some of which were virtually inoperative. Since the war, however, 12 of these plants have been sold, and five more leased. Those sold include branches at Alexandria, Atlanta, Charlotte, Cincinnati, Cleveland, Denver, Des Moines, Indianapolis, Milwaukee, Norfolk, St. Louis and Seattle, while leased plants are at Buffalo, Houston, Los Angeles New Orleans and Omaha.

Ford cannot depend on early return of its leased plants. The list of unavailable facilities for postwar, then, points to a loss of assembly operations at Atlanta, Norfolk, St. Louis, Buffalo and Long Beach. This output will somehow have to be compensated. If Ford cannot repurchase some of the disposed-of plants, new buildings will have to be put up, and it would be reasonable to expect that they would be built in areas close to the ones they replaced. Ford does not plan any expansion against its total prewar facilities, however, feeling that if it can equal its prewar factory space and tooling totals it will have capacity sufficient to meet any demand in sight.

As reported here earlier, Packard will expand its automotive operations, but more by spreading and shuffling them around than by building new plants.

Chrysler Corp. undoubtedly has its eye on the Dodge-Chicago plant as a possible postwar manufacturing and assembly point. This huge plant never realized its potential during the war, schedules having been cut down in recent weeks while they were still quite a bit below originally projected peaks. Chrysler could logically use this plant as a production and assembly point, and may do so in self-defense against the expansion moves of competition, although the feeling within Chrysler top circles is that the company could more profitably concentrate its operations on an around-the-clock basis in present plants in Detroit, rather than add others.

With a favorable manufacturing experience at Lansing during the war, Nash-Kelvinator might be interested in retaining operations there to supply parts to its assembly lines in Kenosha, but this is very nebulous at this time.

Studebaker plans no enlarged facilities. Its prewar assembly was on a one-shift basis; by increasing bottleneck departments to three shifts from two, and by running final lines on two shifts, forthcoming output can be expanded to meet much-fattened requirements.

Nor will Hudson expand its facilities, which probably could have produced 4000 units a week before the war, more than double the then-customary going rates.

Willys-Overland, likewise, will maintain itself in its present facilities at Toledo, which are sufficiently large enough to meet extravagantly widened demands. It should be noted here for the record that Willys has arranged with American Central Mfg. Corp., Auburn, Ind., to produce body-stampings for postwar cars. The American Central plant, it will be remembered, is the former Auburn Automobile Co. facility.

DEEP PROBER: *Over the many duralumin spars of the extensive wing section of the Clipper, this industrial X-ray machine goes probing deeply into the metal for possible hidden flaws that would escape the human eye. Many other precautions are also taken.*

To Select Heat Treating Data Quickly, Accurately

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Washington . . .

L. W. MOFFETT

• Two big business associations seem to be against ripping away WPB controls over civilian manufacture after war with Germany ends . . . Expect mills and factories to ration output voluntarily.

WASHINGTON—The two great business associations, the United States Chamber of Commerce and the National Association of Manufacturers, seem to be against ripping away WPB controls over civilian manufacture after the war with Germany ends.

While no definite statement of policy is available from either association, the very absence of a stated policy together with the pro-regulation viewpoint of some business leaders points toward acceptance of WPB plans to reconvert industry.

It is obvious that business is not indifferent to the prospect of returning to a peacetime economy as soon at it can. Business is anxious to return as soon as the demands of war permit.

Unless some upsurge of contrary feeling soon becomes apparent, it may have to be assumed that businessmen are not only reconciled toward the idea of perpetuating these government controls until Japan surrenders, but are anxious that they be retained. That the majority of industrialists are sincerely anxious that controls continue is doubted. A poll on this question would be interesting and valuable.

Sufficient WPB regulation to insure that the military services get what they need after Germany is defeated, and control over prices until competition makes regulation unnecessary are urged. But the arguments that civilian production has to be controlled to protect the small business man, and prevent consumers of large amounts of materials and components are not convincing.

Of course there will be a grand scramble for materials and components if the midwar open capacity is anything near the 40 per cent WPB Chairman Donald M. Nelson has predicted. This scramble will occur whether or not WPB tried to fix production quotas and generally supervise production schedules, as the Priorities Regulation No. 25 provides.

But the larger manufacturing concerns will have the same postwar advantage of being able to drive harder bargains than their smaller competitors because of tremendous purchasing power as they had before the war. The smaller businesses are expected to occupy the same position they had before the war so far as securing production needs are concerned.

THE mills and the factories will undoubtedly voluntarily ration their output to preserve all the customer relationships they can because business can see a lean period ahead of the postwar consumer goods boom.

If the expected amount of surplus steel turns up, and other materials in proportionate quantities, there will be little material shortage for any kind for civilian manufacture. Estimates are that there will be anywhere from 10,000,000 to 12,000,000 tons of surplus steel in inventory of consumers, mills and warehouses after the war with Germany.

Many types of components needed for war production will serve peacetime manufacturing needs and these are expected to be in plentiful supply.

Of course, much of the steel and other materials will not be in the forms, sizes and shapes needed for increased non-military manufacture, but a slash in consuming industry demand should free the mills to produce civilian type steels in ample quantities.

This will be particularly true if the Navy and the Maritime Commission demand for plates slackens because of cutbacks, so that the continuous strip mills can be reconverted. There are some indications that the merchant ship program may be cutback heavily.

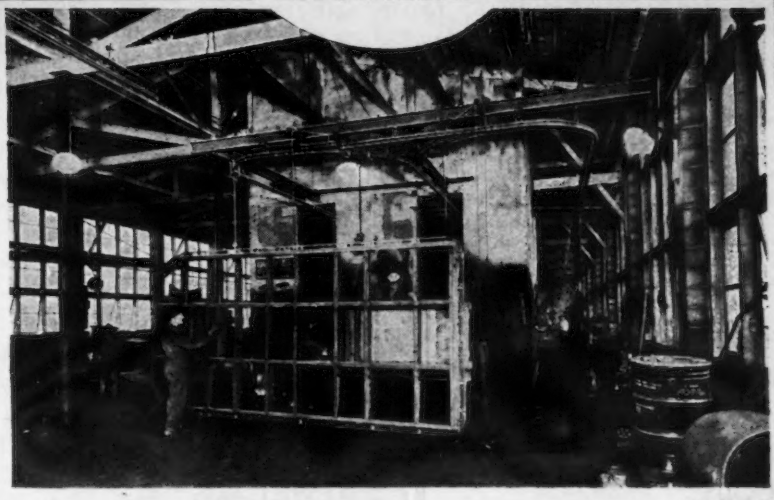
Civilian industry demands for strip and sheet will be high, as these products are necessary in the manufacture of a great percentage of civilian goods. And while the sizes and chemistries of most plate, sheet and strip needed for war purposes which may now become surplus cannot be used for civilian manufacture, some of it can.

CAA CHIEF: *Theodore P. Wright, who has been named Civil Aeronautics Administrator to succeed Charles I. Stanton in Washington. He will assume his new duties on Sept. 1.*

Aside from a distinctly easy material situation in prospect, with the steel mills running at no more than 70 per cent of capacity, manufacturing facilities of all kinds will be available. To be sure, some material and component bottlenecks may develop, but American industry has been brought up in a school of hard-knocks, and can be expected to be able to solve its own problems by itself if let alone.

On the other hand, if WPB material and scheduling controls are maintained through the inexcusably complex spot authorization procedure, the danger of the continuance of these controls after all hostilities cease cannot be minimized. If there is an indefinite continuance of control, the

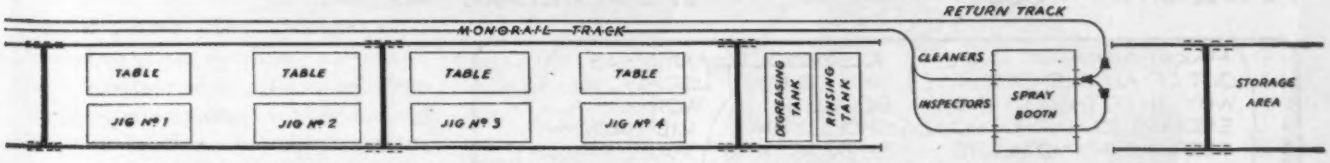
"WE CALLED IN AMERICAN MONORAIL ENGINEERS"



1 One of the jigs where complete chassis is tacked together. Electric hoist on MonoRail crane removes unit to table for complete welding. Completed frames are hung on MonoRail in background for inspection.

2 Air hammers and chippers remove slag from chassis hung on MonoRail tracks. Wiping and final inspection also completed here.

3 Primer finish is sprayed on frames; work being done in booth and on MonoRail loop. Note outside track for return of empty trolleys.



CRANE AND MONORAIL SYSTEMS FOR STRAIGHT LINE PRODUCTION AT YOUNGSTOWN STEEL CAR CORP., NILES, OHIO

● Photos show a recent American MonoRail installation in the plant of a company, which for years has specialized in stampings for truck and trailer chassis parts. Due to increased demands, manufacturing facilities were supplemented to enable them to furnish complete frame assemblies.

We quote part of a letter received from a top official of this company: "After quite some thought, our engineers selected a section of our plant which they believed would be suitable for this type work, and one of our first steps was to call in your company to work with us. . . We are glad to advise that the design accepted worked out very satisfactorily and has allowed us to meet a rather sizable production schedule and keep our costs within our original estimate."

The tricks our engineers have learned in solving handling problems may be of real value to YOU. It will pay you to consult with the American Monorail Engineer NOW! This service is available at no obligation.

THE AMERICAN MONORAIL CO.

13103 ATHENS AVE., CLEVELAND 7, OHIO

business man may as well stop picturing himself as an individualist and abandon hope for reestablishment of the capitalistic society.

BOTH NAM and the Chamber of Commerce have come out for abolition of WPB controls after the war ends in both Germany and Japan, but this may be too late to turn the tide away from state socialism which is what indefinite "WPB-ism" is. It should not be forgotten that labor is urging a guaranteed annual wage, and full employment which cannot be secured in a free economy. It apparently thinks, quite mistakenly, that this can be done under endless Government handouts.

If the United States changes from the relatively free economy of a representative democracy to a totalitarian form of government as a result of the war, many will conclude that the defeat of Germany and Japan has been too costly.

Full employment and production have been the rule during war to defeat the enemy, but the danger of maintaining too long the controls that insured the defeat of the enemy cannot be emphasized.

If security for business and labor becomes the American ideal, then "freedom of enterprise" will be anachronism and buried with it will be the pioneer spirit which has made American industry and labor unbeatable.

Not to be forgotten is the undeniable fact that the continuance of a managed economy makes it necessary for more people with industrial experience to become a part of government. Otherwise, the average bureaucrat cannot be depended upon to make the "spot authorization plan" or any other plan for a changeover to peacetime business work.

Courageous business leadership must prevent the bungling, favoritism and toying with the economic destiny of this country in the most critical period of history. It is clear that WPB has not the managerial brains to make the thousands of decisions requisite to industrial recovery. Nor has any other human organization.

□ ○ □

Slashes ODT Fourth Quarter Requests

Washington

• • • **WPB has slashed** by about one-third ODT's fourth quarter requests for controlled materials from domestic transportation. An ODT statement said that it will receive 1,039,100 net tons of carbon steel in that period compared with a request for 1,532,633 tons and that proportionate cuts had been made in supplies of alloy steel, copper and aluminum. In addition to the direct ODT allotment, it was announced, WPB has set aside an adequate reserve for railroad and local transit maintenance, repair and operating supplies.

The principal reductions in the amount requested by ODT were in rail and track accessories. The new replacement rail request was cut from 550,000 tons to 360,000 tons and allocation for track accessories from 291,000 tons to 190,000 because of demands on rail mills for shell steel and rails for the military. WPB, the statement said, recognized the necessity of increasing the allotment of new replacement rails and accessories as soon as war demands permit.

Allotments for automotive replacement parts amounted to 145,000 tons. ODT had requested 160,000. No allotments were made for light trucks and railroad passenger cars, for which ODT had requested 76,526 tons and 6488 tons, respectively. WPB said these requests were denied because production facilities and manpower questions remain to be resolved. Carbon steel for medium and heavy trucks, truck bodies, trailers, third axles and lower fifth wheels was cut from approximately 200,000 tons requested to 90,000 tons. It was said that the latter figure is sufficient to cover the authorized production schedule for these units for the first quarter of 1945.

ODT carbon steel requirements for locomotives, freight cars, marine equipment, integral buses, street cars, trolley coaches, truck trailers, including petroleum units and water transport equipment, were met.

THE BULL OF THE WOODS — BY J. R. WILLIAMS

MAKIN' A HUNTIN' KNIFE OUT OF AN OLD FILE, HEY? WHY, THAT THING'S BIG ENOUGH TO HARPOON AN ELEPHANT--WHO HUNTS ANY MORE--AND WHAT? NOW IF IT WAS A USEFUL PANCAKE LIFTER ER SUMPIN, I MIGHT NOT YELL SO LOUD!
IN SCHOOL BEHIND MY BOOKS I SHOULD HAVE BEEN KNITTIN' DOILIES FOR MY MOTHER-- BUT NO, I WAS MAKIN' PAPER PIGS AN' MATCHSTICK MEN!
ANYTHING USEFUL IS WORK--IF A KID HADDA MAKE PAPER BEAN SHOOTERS IN SCHOOL, HE'D BE STUDYIN' HIS LESSONS!
J.R.WILLIAMS
RECREATION
9-1
COPR. 1944 BY NEA SERVICE, INC. T. M. REG. U. S. PAT. OFF.

Export Control Removed

Washington

• • • **WPB on Aug. 19** removed export control from the following metals and minerals: antimony, lead, fluorspar, ilmenite and all tin except tinplate scrap.

Typical Results Attained by Plunge Grinding Threads and Forms with a Crusher Dressed Wheel

SHOCK ABSORBER

This part consists of two steel tubes bonded together with rubber. The outer tube is SAE-1015 steel, .093" thick with a ½" threaded section on one end—threads 2⅛"—16N-3. These threads are plunge ground in a fraction of the time without the generation of the high heat inevitable with the single point wheel which caused tube and rubber to separate.

IMPELLER SPACER

This spacer, 2.223" long is ANS-6294 steel, case hardened to 81-84 Rockwell A, and has a .010" of stock removed from each side and bottom of the grooves. Plunge grinding these grooves with a multi-ribbed wheel is accomplished in one-sixth the time it takes to grind them with a single point wheel.

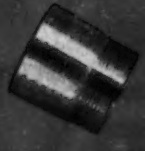
GOVERNOR PISTON

This piston, 1.591" long, is chrome-molybdenum steel 26-36 Rockwell C. Plunge grinding takes .005" from the outside of four shoulders leaving sharp corners. Production rate by plunge grinding is ten times as fast as it is by older methods.

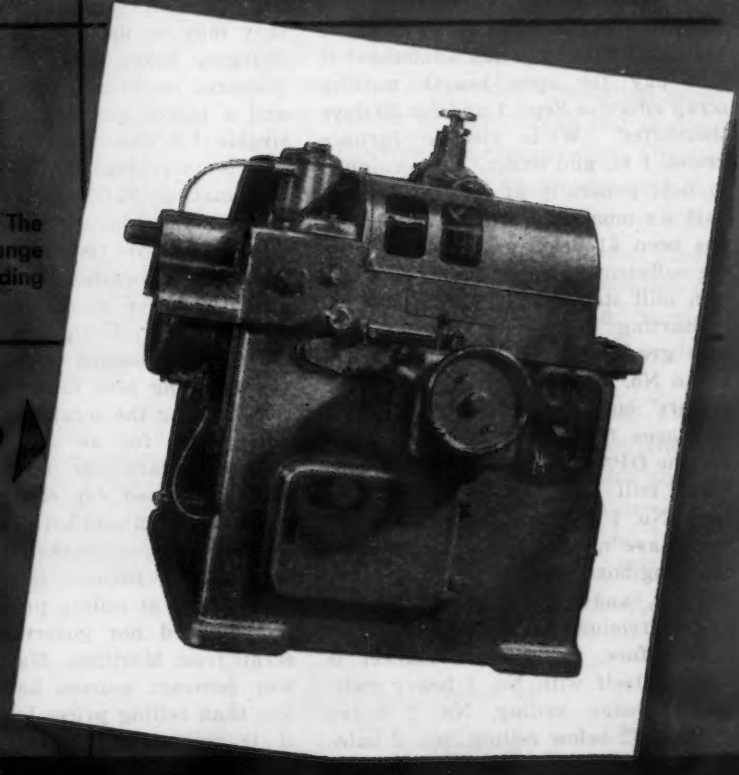
PROPELLER STUD

This stud is chrome-molybdenum steel 32-36 Rockwell C. The threaded section, 11/16" long (⅞"—20NF-3), is plunge ground in one-third the time required by conventional grinding.

SLEEVE



This sleeve is SAE-1015 steel 25-30 Rockwell C. The threaded section, ½" long (1⅜"—18N-3), is plunge ground in one-quarter the time required by grinding with a single point wheel.



All the parts shown here have been processed on the Sheffield Precision Thread and Form Grinder under normal operating conditions.

This machine, using a crusher dressed multi-ribbed wheel, plunge grinds single- or multi-start threads, eliminating thick first and last threads. It plunge grinds forms of almost any contour. It is also used to traverse grind single- or multi-start threads with a multi-ribbed wheel or it may be used with the conventional diamond dressed single point wheel.

Write for complete story on crush- or roll wheel dressing and plunge grinding—Bulletin M-100-144.

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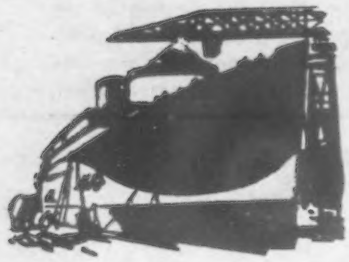
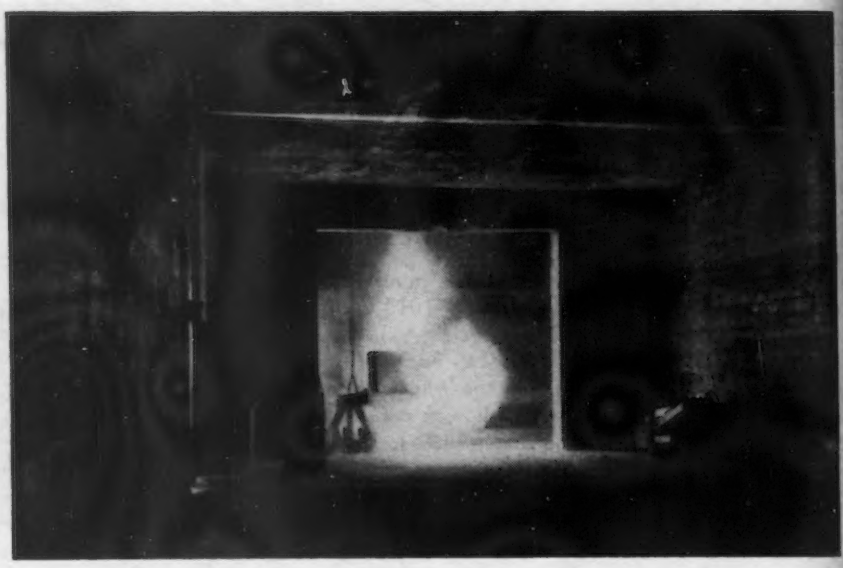
WEST COAST . . . .

OSGOOD MURDOCK

• Differentials restored for scrap grades bracketed in OPA ceilings . . . Mill buyers anticipate further weakening of artificially maintained market already well below ceilings.





SHOOTING GALLERY: *At Seattle, an airplane machine gun is being set on a ballistic pendulum in the blast chamber of the firing range. One hundred yards down this tunnel is the target. The vents in the walls allow expanding gases to escape.*

SAN FRANCISCO — A further weakening of the already soft, artificially maintained and oversupplied steel scrap market on the West Coast is reflected in the prices and differential schedule which the Columbia Steel Co. has announced it will pay for open hearth melting scrap effective Sept. 1 and for 30 days thereafter. While electric furnace grade, 1 ft. and under, has continued to hold generally at ceiling, for the past six months, No. 1 heavy melting has been $1 below ceiling, and moving sufficiently at that figure to maintain mill stocks.

Starting next month it appears that grade differentials between No. 1 and No. 2 heavy melting and No. 2 dealers' bundles will be restored in this area from their bracketing under the OPA ceiling schedule. Pacific Coast mill buyers also find that to them No. 1 railroad scrap and scrap rails have no greater use value and charging box weight than No. 1 heavy melting, and they are unwilling to pay a premium for railroad scrap.

Therefore, the current market is finding itself with No. 1 heavy melting $1 below ceiling, No. 2 heavy melting $2 below ceiling, No. 2 bales $3 below ceiling and No. 3 bales at $10, approximately $4.50 below ceiling and unsought even at that figure. So abundant is the supply of machine shop turnings in the Los Angeles area that they are currently moving at $4 to $4.50 whereas the ceiling is $11.58.

Berg Metals Corp. at Los Angeles has worked out a technique for crushing and compressing turnings so that they may be used to add weight to charging boxes. For such specially prepared material a premium is paid and a larger quantity would be desirable if it were available.

It is understood that shipments approximating 35,000 tons per month of premium shipyard scrap have continued to move from Pacific Coast yards to Midwestern mills on WPB allocation ever since the middle of last February. Until now Midwestern mills have seemed willing to pay Coast ceiling plus land-grant freight cost, landing the scrap at Midwestern mill points for an up premium of several dollars per ton. Shipyard scrap prepared for electric furnace grade has been sold both on allocation and on the open market to foundries and electric furnace buyers on the West Coast at ceiling prices. So far no shipyard nor government owned scrap from Maritime, Naval or other war contract sources has moved at less than ceiling prices but when and if transcontinental scrap shipments are suspended and when Midwest buyers are no longer willing to pay a premium for Pacific Coast shipyard scrap, it seems evident that demand for open hearth commercial melting grades will be further depressed.

WPB representatives are unhappy to see mill stocks declining on the West Coast and point to reduced reserves in dealers' yards. Dealers and mills, on the other hand, are preparing for and anticipating further market weakness and see no commercial incentive for more than hand-to-mouth purchases under the present prospect. In fact, buyers see little reason for continuing a system of allocations and attempt to maintain ceiling prices when the present free market would seek a lower level.

SEVEN days have witnessed a superficial, nominal withdrawal of the limitation of work order by Lodge 68 of the AFL machinists, but no genuine clearing of the sullen, unhealthy war production atmosphere. Five days after the "seizure" of five uptown machine shops by Rear Admiral H. G. Bowen for the U. S. Navy, 99 other San Francisco uptown shops were "seized" so that the Navy is now nominally in possession of every San Francisco machine shop member of the California Metal Trades Association that has a contract with Lodge 68 AFL. In a Sunday star chamber closed-door mass meeting which was said to have been attended by 2500 of the 11,000 members of the lodge, it was announced by the business agents that penalties would henceforth be imposed on any member for working over 8 hr. per

What this man knows is worth millions of dollars! More than a quarter century ago, he started studying fire's every trick. The fact that he learned so thoroughly—and is still learning—is often the margin between small loss and total destruction. Where greener hands must experiment, the fire chief's long and varied experience tells him exactly what needs to be done and how to do it.

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day or over 48 hr. per week. Thereupon the meeting voted to continue the ban on overtime until a new contract with the employers is signed. WLB has forbidden negotiations for a new contract while the ban continues. Technically, therefore, the stalemate continues; actually most members are back at work on schedules posted by the war working shops. After a week many machinists continue defiant, arriving at work too late to put in more than 8 hr.

Simultaneously, a Pacific Coast shipbuilding conference under the chairmanship of Paul R. Porter of WPB adjourned futilely and ineffectually after two weeks' attempt to iron out the chronic beef of shipyard machinists who usually engage in repair work, when they are asked to complete a new vessel partially built at another shipyard. New construction pay is 11.6 per cent lower than repair pay for machinists by contract, so the widely heralded "Win-the-War" spirit of the rabid workers does not prevail when a repair machinist is exposed to new construction.

LABOR turnover at Calship, at Wilmington near Los Angeles, has dropped to the lowest point in a year, 7.3 per cent per month compared with 9.1 per cent average for the first six months of the current year. For women, it averaged 12.2 per cent per month, from January to June. Absenteeism dropped as low as 8.25 per cent from 9.49 per cent in June. For the first month this year, Calship actually increased its total working force. Of the 894 "in migrant" new-hires, during July the greatest number came from Texas. This yard's total force has declined from a peak of 42,000 last fall to 34,121 in June despite an AAA priority from WPB and the highest wage rates in war work. A big force of traveling recruiters supplements the orders, directives and referrals of WMC and USES, but it has not been possible to maintain the working force.

From Seattle Boeing keeps a corps of 40 recruiters operating in Midwestern, Southern and Eastern sections of the United States. These labor scouts immediately invade areas affected by cutbacks in other aircraft plants in an effort to pick up surplus manpower. The company is in urgent need of several thousand more production workers at its Seattle, Renton, Everett, Hoquiam and Tacoma, Wash., plants.

In southern California WMC states the peak of employment was reached last December. Between May 1 and Aug. 1, in three months, there was a total decrease of 24,235 in the working force of primary war, industries in southern California, 90 per cent from aircraft and exclusive of parts manufacturers. Yet AFL shipwrights Local 1149 protests bitterly because the Pacific Bridge Co. at Alameda announces a shutdown schedule at its current contract terminates affecting from 1000 to 1500 men, and there are sobs and sympathy for the 1100, mostly women, who have been faithfully at work at Hammond Aircraft at South San Francisco for a year.

To an increasing number of workers, the problem these days is not a job or employment but my job and most preferential employment, nearest home, highest wages, best working conditions.

IN the nine-story, block-wide Furniture and Merchandise Mart on upper Market Street are housed most of the regional and district offices of Federal War Agencies. A peak staff of 1750 has now settled down to between 1400 and 1500 men and women with OPA, WPB, WLB, ODT, WMC, OEM, SWPC, OCD, OWI and such more exclusive outfits as the Bureau of Labor Statistics, Army Chemical Warfare, Army and Navy Salvage Offices, Committee for Congested Areas and the Committee for Fair Employment Practices. Addressed to the San Francisco *News* and appearing in the Letters to the Editor column one day last week was the following revealing communication:

"Editor: I was amused by the inference that there may be Communists in the United Federal Workers group. It is the belief of so many of us who work here (1355 Market Street) that we are surrounded by 'Reds' that we affectionately call the Furniture Mart the 'Kremlin.'

"All of them are in the UFWA and at the present time they are spending a lot of government time going around attempting to get us to write Congress to repeal the Hatch Act. This, I understand, is the act which indirectly prevents known Communists from being employed by the Federal government. Why they should worry about a few known ones I do not know, for the unknown ones seem to have packed these new war agencies.—Edna Higgins."

Boring from without or scoring from within?

Cited for Awards

• • • **The following companies** have been awarded the Army-Navy E for outstanding war production:

Ace Mfg. Corp., Philadelphia. (second star)
Electric Boat Co., Bayonne, N. J. (fourth star)
Westinghouse Electric & Mfg. Co., Cleveland Lighting Division, Cleveland.
Brown Instrument Co., Philadelphia. (second star)
Milwaukee Stamping Co., Milwaukee.
Consolidated Engineering Corp., Pasadena, Cal.
S. B. Foot Tanning Co., Red Wing, Minn.
Herschede Hall Clock Co., Cincinnati.
Kahlenberg Brothers, Two Rivers, Wis.
W. L. Maxson Corp., New York.
May Oil Burner Corp., Baltimore.
Moorlane Co., Tulsa, Okla.
Production Plating Works, Inc., Lebanon, Ohio.
Republic Stamping & Enameling Co., Canton, Ohio.
Sonotone Corp., White Plains Plant, White Plains, N. Y.
United States Industrial Diamond Corp., Adamant Tool Co. Division, Bloomfield, N. J.
Henry Weis Mfg. Co., Inc., Elkhart, Ind.
Cairns Corp., Brooklyn, N. Y.
Electrical Research Laboratories, Inc., Evanston, Ill.
Marietta Mfg. Co., Point Pleasant, W. Va.
Ingalls Iron Works Co., Verona Plant, Verona, Pa.
Solar Aircraft Co., Des Moines Plant, Des Moines, Iowa.
Leich Electric Co., Genoa, Ill.

Maritime M

Edge Moor Iron Works, Inc., Edge Moor, Del.
Farrel-Birmingham Co., Inc., Ansonia and Derby, Conn., and Buffalo.
Marinship Corp., Sausalito, Cal. (third star)
Ajax Iron Works, Corry, Pa.
Crane Co., Chicago.
Lidgerwood Mfg. Co., Elizabeth, N. J.
Sperry-Gyroscope Co., Inc., Marine Division, Brooklyn.
Buckler-Chapman, Portland, Ore. (second star)
R. D. Cole Mfg. Co., Newman, Ga. (second star)
Gunderson Bros., Portland, Ore. (second star)
Lionel Corp., Irvington, N. J. (second star)
E. H. Scott Radio Laboratories, Inc., Chicago. (second star)
W-K-M Co., Inc., Houston, Tex. (second star)
Webster-Brinkley Co., Seattle. (second star)
General Machinery Corp., Hamilton, Ohio. (fourth star)
Joshua Hendy Iron Works, Sunnyvale, Cal. (fourth star)

Fontana Mills Produce 10,000 Tons of Production Plate

Washington

• • • **Last week** it was erroneously stated that the Henry J. Kaiser Associates mill at Fontana, Cal., produced 10,000 tons of plate less in July than in June. [THE IRON AGE, page 94, Aug. 10.]

The Fontana mill plate production has dropped, however, from a high of about 33,000 tons in February to 19,000 tons of plate in July, a loss of about 14,000 tons in five months. It is reported that USW was recognized by the company in February, and that incentive rates are now being established.

HYDRAULIC BALANCE

CANCELS OUT BEARING LOADS

And Means MUCH LONGER PUMP LIFE

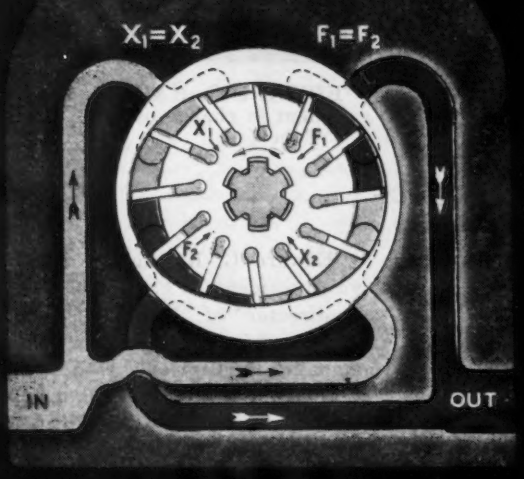

Diagram showing patented "Hydraulic Balance" construction.

VICKERS

Balanced

VANE TYPE PUMPS

As illustrated by the diagram above, equal and opposing pressure areas are provided on the outlet side and on the inlet side of Vickers Balanced Vane Type Pumps. The equal and opposing radial hydraulic thrust loads cancel each other . . . consequently there are *no* bearing loads resulting from pressure. The major cause for wear is thus completely eliminated and the result is much longer pump life. This "Hydraulic Balance" construction is exclusive with Vickers Vane Type Pumps; it also permits an unusual design compactness and is an important reason for the exceptionally high efficiency of these pumps.

Vickers Balanced Vane Type Pumps are available in single-stage for 1000 psi (see Bulletin 40-25a); two-stage for 2000 psi (see Bulletin 40-16) and also two-pressure, large-small volume (see Bulletin 38-14). Vickers Application Engineers will gladly discuss with you the many different types of hydraulic power and control circuits on which these pumps have improved machine performance. Write the office nearest you.

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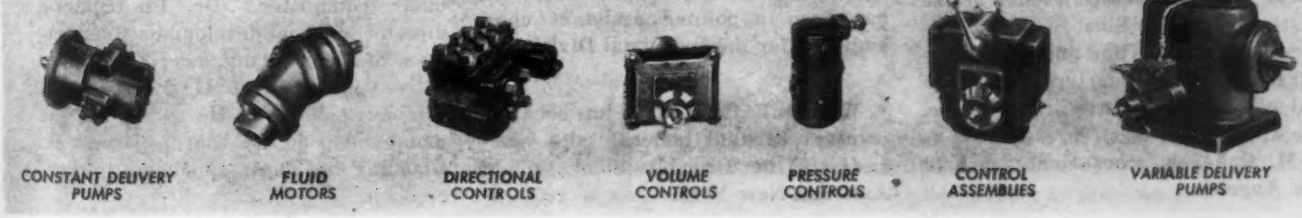

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PERSONALS

STEVENS A. BENNETT, vice-president, United States Steel Products Co.

• **Stevens A. Bennett** has recently been elected vice-president of U. S. Steel's subsidiary, United States Steel Products Co., in charge of the Bennett Mfg. Division, Chicago and New Orleans. He is the former president of the Bennett Mfg. Co., assets of which recently were acquired by the United States Steel Products Co.

• **Dr. Orlan M. Arnold**, formerly professor of chemistry at Rensselaer Polytechnic Institute, has joined Chrysler Corp.'s Engineering Division to establish a new physical-chemistry research laboratory. His experiments will include research in the molecular structure of oil, paint and plastics, and the refinement of insulation materials, textiles and others.

• **William Bishop, Jr.**, manager of the WPB Worcester priorities board since April, 1943, has resigned to join the Worcester Pressed Steel Co. management, and **Daniel E. Hennessey**, in the WPB production department two years, has become plant manager of the Springfield Wire & Tinsel Co.

• **Peter B. Kline** has been made manager, Eastern sales, and **Thomas L. Moore** manager, Western sales of the Rustless Iron & Steel Corp., Baltimore. Both Mr. Kline and Mr. Moore will maintain headquarters in the general offices of Rustless at Baltimore. The new West Coast representative is **S. M. Gahagen**, whose offices are in Los Angeles.

• **Norman A. Stooker**, who has been with the Service Engineering Division of the Cleveland Graphite Bronze Co. since 1928, has been appointed district sales engineer with headquarters in Milwaukee.

• **H. C. Kenyon** has been advanced to the position of general sales manager of the Inland Rubber Corp., Chicago, a subsidiary of the Minnesota Mining & Mfg. Co. Mr. Kenyon will direct an active sales campaign of Inland vulcanizing equipment and tire patching materials which the company has inaugurated to relieve the tire shortage problem.

• **Henry G. Tarter** has been made chief engineer of the aircraft carburetor engineering department of Bendix Products Division, South Bend, Ind.

• **C. W. Perelle** has resigned as vice-president in charge of manufacturing for Consolidated Vultee Aircraft Corp. He will become an official of Hughes Tool Co., Houston, Tex.

• **Harry D. Beutlich** has been appointed director of industrial relations for the Warren City Mfg. Co., Warren, Ohio. Mr. Beutlich was formerly director of industrial relations for Willys-Overland, and prior to that time served in a similar capacity with other nationally known companies.

• **L. C. Truesdell** has been named sales manager of the Manufacturing Division of The Crosley Corp., Cincinnati. He will continue with his former responsibilities as assistant commercial manager, but, in addition, will now have direct charge of all field operations. **B. T. Roe**, manager of distribution, has resigned from the company to join the J. N. Ceazen Co., Los Angeles, as vice-president and general manager.

• **R. G. Wingerter**, for the past six years an industrial engineer for Timken Roller Bearing Co., Canton, Ohio, has been appointed assistant chief engineer for the Industrial Division.

• **William E. Pennington** has been appointed assistant general sales manager of the Crucible Steel Co. of America, New York.

EDWARD G. HARDIG, vice-president in charge of sales, National Tube Co.

• **Edward G. Hardig** has been made vice-president in charge of sales and a director of National Tube Co., Cleveland. He was formerly sales manager and prior to that, for 11 years, represented the company in the Detroit district. **Douglas C. Albright** has been appointed vice-president and assistant to the president. Previously, for 23 years, he was connected with the automotive and aircraft industries in various technical and executive capacities.

• **O. L. Earl** has been appointed vice-president and member of the board of directors of Acme Aluminum Foundry Co., Chicago. Mr. Earl will direct sales and sales development of new products for the company.

• **A. Felix du Pont**, vice-president of E. I. du Pont de Nemours & Co., Wilmington, Del., has retired as a member of its finance committee. He will continue to serve as a member of the board. **Edward B. Yancey**, until now general manager of the explosives department, has been elected a vice-president and member of the executive committee. **Emile F. du Pont**, will succeed A. Felix du Pont on the finance committee. **Dr. Fin Sparre**, director of the development department of the company, has retired from active service after 41 years in the company's employ. He will retain his membership on the board. **Ernest K. Gladding** has been appointed to succeed him.

• **A. J. Werner**, former vice-president and general sales manager of the Wisconsin Bridge & Iron Co., has resigned to become a stockholder, director and vice-president of the A. F. Wagner Iron Works, Milwaukee, Wis.

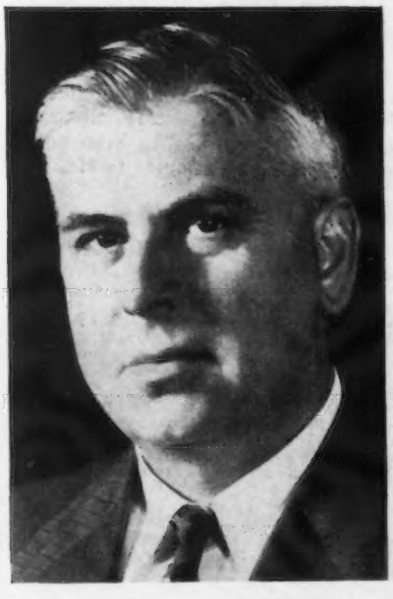
• **G. A. Marks**, former auditor for Gary Armor Plate Division, Carnegie-Illinois Steel Corp., has been appointed assistant auditor for Gary Works. **J. H. Helenhouse** has been named assistant works auditor and **E. B. Curtice**, also has been appointed assistant works auditor.

• **Col. Walter F. Siegmund** has been appointed general sales manager for the Olin Corp., with headquarters at East Alton, Ill. Col. Siegmund was formerly sales manager of the Western Cartridge Co.

• **William H. Kramer, Jr.**, has been named production manager of the Stover Lock & Machinery Corp. He will direct production at the company's recently enlarged plant on Bushkill Creek, Easton, Pa.

• **Ralph W. Hisey**, vice-president of The Osborn Mfg. Co., Cleveland, has been promoted to the position of vice-president in charge of all manufacturing and engineering of both the Brush and Machine Divisions of the company. Mr. Hisey has been associated with the company for over 30 years and has been vice-president since January, 1935. **Hugh M. Little** has been appointed works manager of both divisions.

RALPH W. HISEY, vice-president in charge of Brush and Machine Divisions, The Osborn Mfg. Co.



ALEXANDER S. KELLER, vice-president, Niles-Bement-Pond Co.

• **Alexander S. Keller** has been elected a vice-president of Niles-Bement-Pond Co., West Hartford, Conn. Mr. Keller joined the company in 1931. With his elevation to vice-president, he will devote the bulk of his time to the promotion of export sales as head of the Pratt & Whitney Foreign Sales Department.

• **J. R. McMahon** has been appointed to the newly created post of supervisor of stores for the Pullman-Standard Car Mfg. Co.'s eight plants. He was formerly manager of priorities.

• **Edward A. Willson** has been named resident supervisor of the synthetic rubber laboratories operated by B. F. Goodrich Co. at Kent State University, Kent, Ohio. Mr. Willson came to the research laboratories of the company in 1928.

• **Thomas P. Gorter** has been appointed sales director of transportation equipment for the United States, Canada and Mexico and has been elected a director of the Pullman-Standard Car Export Corp. He was elected a vice-president in January, 1944.

• **G. C. Hoyt**, vice-president of International Harvester Co., Chicago, has been named head of a new organization for foreign operations, except Canada. **C. N. King** has been made director of foreign operations. **A. M. Rode** has been appointed director general of European operations and **J. L. Camp**, director general of Latin American operations.

• **Thurlow E. McBride** has been elected to the office of vice-president and treasurer of American Engineering Co., Philadelphia. He was formerly comptroller of Republic Drill & Tool Co., Chicago.

• **Richard M. Wilson** has been made manager of the Marine Division of the government office of Westinghouse Electric & Mfg. Co., Washington. **Harry A. Kinley**, affiliated with the Westinghouse Lamp Division for 34 years, has been appointed manager of the company's district office at Detroit, Mich., and **W. H. Loeber** has been made Eastern district manager of the Electric Appliance Division. His office will remain in New York.

• **M. M. Clark** has joined Climax Molybdenum Co., New York, as metallurgical engineer of the Ohio district. Before coming with Climax Molybdenum, Mr. Clark had a wide experience in the steel industry, including connections with United Alloy Steel Corp., Central Alloy Steel Corp. and Carnegie-Illinois Steel Corp.

OBITUARY...

o o o

• **Ralph T. Lichtenstein**, 54, Eastern district manager of the Signode Steel Strapping Co., died August 19 at his home after a prolonged illness.

• **George F. Evans**, 63, vice-president and treasurer of Beals, McCarthy & Rogers, Inc., Buffalo, died August 12 at his home in Kenmore, N. Y.

• **Reynold C. Caldwell**, purchasing agent of the American Rolling Mills Co., Middletown, Ohio, died suddenly August 8. Mr. Caldwell, who was 56, had been with the company for 29 years.

• **Albert H. Killinger**, vice-president and director of Laclede-Christy Clay Products Co., St. Louis, died at Durango, Col., August 18, after a brief illness.

• **Shelby M. Jett**, a director and secretary of B. F. Goodrich Co., Akron, Ohio, died suddenly August 9 of a heart attack while aboard an airlines plane. Mr. Jett had been secretary of B. F. Goodrich since 1927. He also headed the legal department of the company.

• **John C. Dilworth**, manager of sales, Railroad Materials and Commercial Forgings Division, Carnegie-Illinois Steel Corp., died August 23 at his home in Pittsburgh.

• **John J. McCarthy**, research engineer, died at Newbury, Mass., August 13. As an inventor, he held many patents in the field of internal combustion Diesel engines.

Fatigue Cracks . . .

BY A. H. DIX

England's Shame

• • • We have inventoried our own pent-up demand for postwar goods and have found we will get most of them from Sam Meyer, who runs the hardware store in our town. We thirst most of all for a lawn mower with ball bearings and rubber wheels, next for two copper downspouts for the front of the house, an electric mixer for the kitchen, and a hedge shears that will cut rather than mangle privet stalks, and which will not be so heavy as to palsy us for two hours after using.

Which enables us to mention that the Philadelphia member of this page's loyal army of eighteen readers writes that the French have a pretty term for hardware. They call it "quincaillerie." We don't know how to pronounce it, but we have no doubt that it sounds just as pleasant as it looks.

Contrast it with the English term for hardware—ironmongery. This, it seems to us, is the most unfortunate name that has ever afflicted a business. Many an able man must have been dissuaded from entering this honorable profession simply because his children would be obliged to say "My father is an ironmonger."

"Monger" has picked up derogatory connotations through the years, and we think the English, who have such a flair for giving their towns and streets attractive names, should do something about it.

Low Moan from Woollcott's Shade

You say, "Woollcott coupled adjectives with opposed nouns—example: quietly insane."

Egad, sir, even at his wits' end, Woollcott never did that! Maybe what he did was to couple adverbs with nouns. At least, is not that what your allegation shows?

—*H. F. Cotter*

Our error must have caused the rotund shade of Woollcott, a precisian of note, to quiver with anguish, but the above is no sedative. Zounds, man, "insane" is no noun.

Now that each of us have sliced one into the woods, may we return the ball to the fairway by remarking that what Woollcott did in the instance cited was to team up an adverb with a contrasting adjective?

No Change in Burma Road

On page 94 of the Aug. 10 issue of your favorite publication, and sometimes our favorite, demon rum seems to be mixed up with the photographic editor. Why doesn't he have the picture printed right side up? Or is the paper shortage so acute that you cannot spare the vertical space?

—*J. W. M., Buffalo, N. Y.*

If our picture editor had shown the Burma Road edgewise, instead of at rest, in which position everyone has seen it dozens of times, we would have been quick to spring to his defense. We would have called it editorial license, pointing out that his is paid up to the end of next year.

But he did not choose to exercise his license, as a comparison with the original photograph shows the cut is positioned to conform with what met the lens of a U.S.A. aerial camera. However, it looks better to us if turned edgewise, making the right margin the bottom.

A Light Dawns

• • • We find contrasts handy when people ask us where we work. When we answer "For the Iron Age" they usually look blank, and when we add "It's a magazine that goes to people who make metals and metal products" they still look blank. So we follow up with a selection of alliterative mismates, "You know, plants that make bulldozers and baby buggies, harrows and hairpins, gantries and garter clasps, birdcages and battleships, skillets and skiphoists, automobiles and autoclaves, gas tanks and gudgeons, locomotives and lipsticks."

We just enrolled a new subscriber, the Sterling Manufacturing Co., whose customers are undertakers, which gives us another pair—embalming instruments and escalators.

Now They Are Five.

For your distinguished name club, I should like to add to Colonel Oveta Culp Hobby, Dr. Icie Macy Hoobler, Dingle Machintosh Foot, and J. Flipper Derricotte, the name of Miss Imo Alma Yoho, of Ohio. . . .

Mr. Foot should be president and Miss Yoho secretary of the Club.

—*Howard Booher, Pittsburgh Steel Co.*

Miss Yoho is voted in, as soon as we get her address, as Ohio is not definite enough. But the name of another candidate submitted by Mr. Booher is withheld for the reason that its strength is mainly in the oddity of the family name. No man is entitled to credit for his family name, as it is something over which he has no control. It is what he does with his first and middle names that counts.

Our own preference is for the unobtrusive family name that is made to sparkle in the effulgence of a chromium-plated surname. For this reason we look with favor on Mr. Foot as president of the D. N. Club. He might have smothered a beautiful thing by calling himself "D. M. Foot," and a professor with the garden variety name of Tom W. Wilson might have died in obscurity if he had not boldly sloughed off the first name and unfurled the middle initial into the unforgettable pennon of Woodrow.

Squawk—Unjustified

. . . Why should our f.f.j. not be above mis-spelling the most mis-spelled word in chemistry? Page 17 of the July 16 issue refers to low PHOSPHOROUS, copper-free iron.

—*John Howe Hall*

According to our book *phosphorus* is the noun and *phosphorous* is the adjective. So the above is correct, unless the chemists, in convention assembled, decided to drop the third "o" in the adjective. If this snide trick was pulled on Joseph Devlin, M.A., who edited our drug store dictionary, we will apologize to Mr. Hall in a later issue.

Puzzles

Two answers to last week's problem are:
$3 \times 3 - 3 - 3 - 3 = 0$, and $3\sqrt{3} \times 3 \times 3 - 3 = 0$.
There may be more.

D. (Weldrite Co.) Margaris writes:

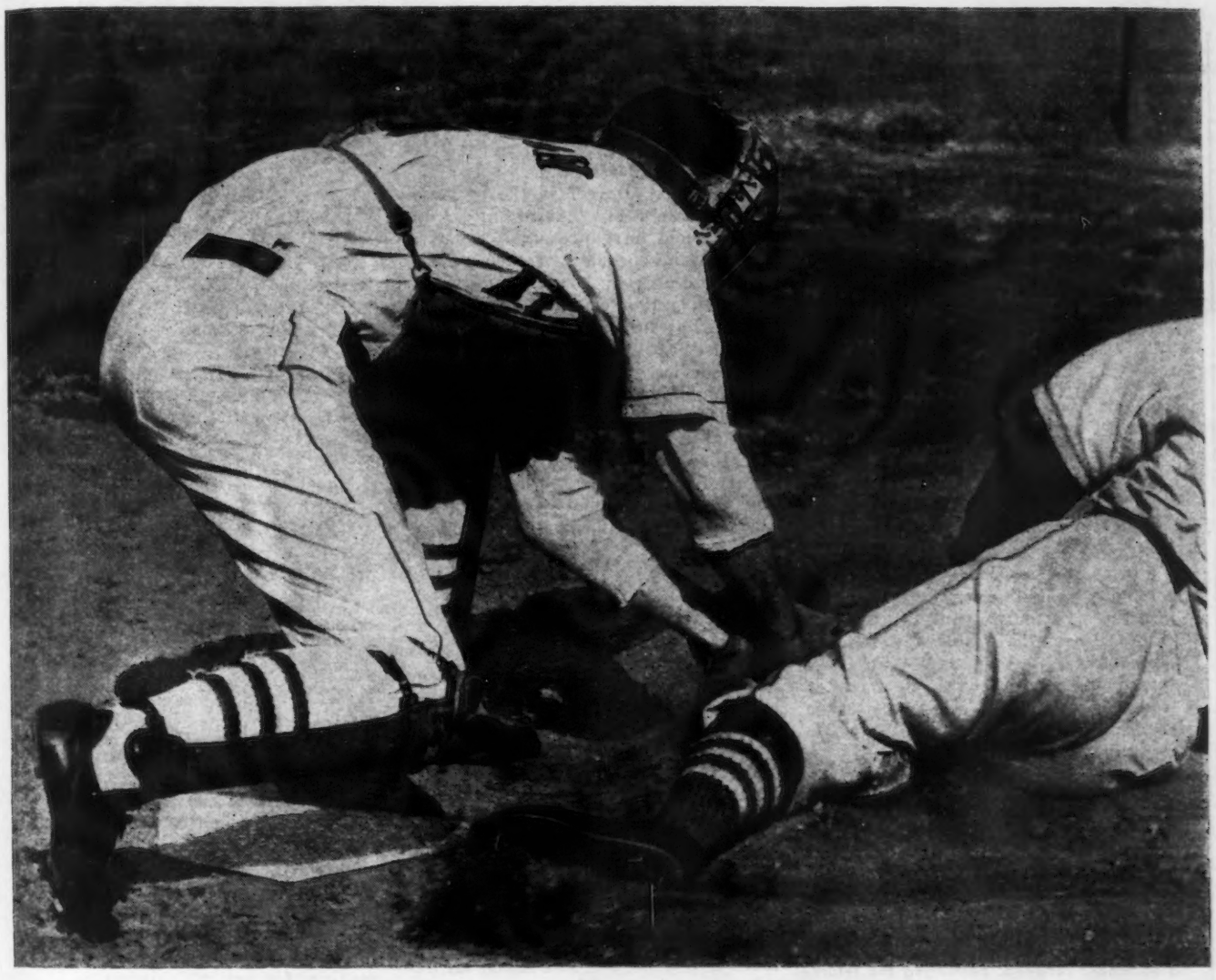
All the boys here at Weldrite are tearing their hair out over the one about the three houses to be connected with gas, water and electric lines without any of the lines crossing. Please send solution.

The problem presents an impossibility, like poking the index finger of your right hand into a circle made up of the thumb and index finger of your left hand, and withdrawing the right index finger quickly enough to be caught by the right hand. It cannot be done but there is no harm in trying.

Time allowance for this is 150 seconds:

A Greek addressed his clock, "Best of clocks, how much of the day is past?" The clock answered, "There remains twice two-thirds of what is gone." What time was it, based on a 12-hour day?

"FAIRBANKS-MORSE SCALES—ARBITERS OF BUSINESS"



What's YOUR Decision!

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Scales

Dear Editor:

JAP WAR PLANT MAP

Sir:

We have kept our copy of "The Iron Age Map of Japan's War Plants" posted since receiving it in your Apr. 30, 1942, issue, and thus have had many requests for copies.

I would be very grateful if you could inform me whether such copies are available.

G. M. COUGHLIN,
Superintendent of Steam Power
American Rolling Mill Co.,
Ashland, Ky.

● We have no more copies of the 11-in. by 29-in. map in its original three-color form, but can furnish reprints in black and white.—Ed.

TEAR SHEETS

Sir:

I have been reading your magazine for many years, and saving articles of interest. In tearing out the pages I want, almost invariably the binding edge tears. It seems to me that if you scored or perforated each page it would be a help to the many other readers who do the same. What do you think?

ROMAN WINOGRAD
4300 Broadway,
New York 33

● Even if postoffice regulations did not forbid publications mailed at second class rate from perforating or scoring their pages, we doubt whether the speed with which The Iron Age is printed and bound would permit this operation. The difficulty of removing pages will lessen, of course, when paper is no longer rationed, permitting the return to wider margins.—Ed.

ELECTROLYTIC TIN PLATE

Sir:

"News Front" in my favorite family journal of July 27 has some very interesting remarks concerning electrolytic tin plate. My recollection is that items from this page are generally covered in more detail by technical or other articles in the same or following issues, but in this particular case I do not find it. I would like to have as much further detail as you can supply.

S. G. BAKER, Director,
Electroplating Div.
E. I. du Pont de Nemours & Co.,
Wilmington, Del.

● When, as frequently happens, an item appears in "News Front" that is not extended elsewhere in the issue the reason is that we have no additional information on which to develop a broader story. The information in the July 27 issue was based primarily on conversations with various companies having electrolytic tin plate installations. Some of the comments may be slightly inaccurate, but at the moment they reflect the current thinking of several of the larger users of this process.—Ed.

PICKLING TANKS

Sir:

We have read with interest your August 3 article, "Stainless Steel and Magnesium Pickling."

While we appreciate the fact that pickling solutions containing hydrofluoric acid have presented a serious maintenance problem at elevated temperatures in conventionally constructed tanks, we are surprised to learn that no mention was made of the use of carbon brick linings in such service.

Such linings have been in commercial use for the past eight or ten years in stainless steel pickling with temperatures running in the neighborhood of 180 deg. to 190 deg. F. without serious maintenance problems.

L. C. WERKING, Manager,
Specialty Dept.
National Carbon Co.,
Cleveland

SMALL PLANT PROBLEM

Sir:

How is it possible for a plant employing approximately eighty persons with limited capital to prepare, build models, and test items for post-war manufacture? Manufacturer has not the facilities for testing necessary before a product can be accepted for production. There are enough ideas of merit, but no facilities, among which are the funds required for such work.

No doubt there are many other small manufacturers in this predicament and if anyone has found an answer to this question we would be grateful if it could be given to us.

G. KLEEBERG,
President
Maritime Quality Hardware Co.,
Belfast, Maine

OIL FINDER

Sir:

I have in mind to get your IRON AGE but I do not find time to read. My wife and I have no help at all and the many papers from the government have made slaves of us. I have an oil finder and gas finder. There is no hidden oil down in the earth that I cannot map down to the thickness of this paper and how many strata have oil and with the speed of an auto I can register the pools, but as geology don't speak of the many wonders God put down under for the use of man, I can't help it if I feel that I would show the wonders I find down under to the greatest in the land who are spending millions to try and locate it, while with someone running the car I can pick up oil at any speed.

Many people have a one-track mind and although it was proved that the world is not flat, the same goes today, but as I have not charged one cent and am only interested in running on to something new in the way of the wonderful chains and so forth, I proved to some that listened, that they are fixed for life and did not charge one cent.

JOSEPH F. DORNACHER
Osage, Wyo.

SCRAP BELOW OPA CEILINGS

Sir:

OPA CEILING PRICES AS PUBLISHED BY IRON AGE ARE NOT REFLECTIVE OF PRESENT MARKET. DEFINITE SALES OF OPEN HEARTH SCRAP WERE MADE 15.50 TO 15.75 DELIVERED DOCK DETROIT. DEALERS IN MICHIGAN AREA HAVE CONTRACT BASED ON IRON AGE QUOTATIONS LESS SET DIFFERENTIAL UNLESS CURRENT PRICES ARE PUBLISHED BY IRON AGE SCRAP DEALERS IN MICHIGAN STAND TO LOSE FROM 2.00 TO 2.50 PER TON ON ALL MATERIAL PURCHASED UNTIL SUCH TIME AS IRON AGE PUBLISHES CURRENT QUOTATION.

N. A. SCHLAFER,
President
Michigan Chapter,
Institute of Scrap Iron and Steel,
1950 Medbury,
Detroit 11

Sir:

In the steel and iron scrap markets, the general law of supply and demand is again in operating effect and, also, the more rigid control of inventories has become a major factor effecting the flow of such scrap materials.

IRON AGE has been used by us for many years as the basis for contract selling of ferrous scrap at all of our plants throughout the country. There has been no other generally accepted medium for pricing shipments.

The OPA ceiling price regulations are not effective any more except in spots, as most grades are being traded in at prices lower than ceilings. In effect, commercial values are operative.

We would very much like to have you renew your publication of going market prices as soon as possible so we can plan our contract terms accordingly. . . .

C. R. STEVENS,
Purchase Engineer
Westinghouse Electric & Manufacturing Co.,
East Pittsburgh

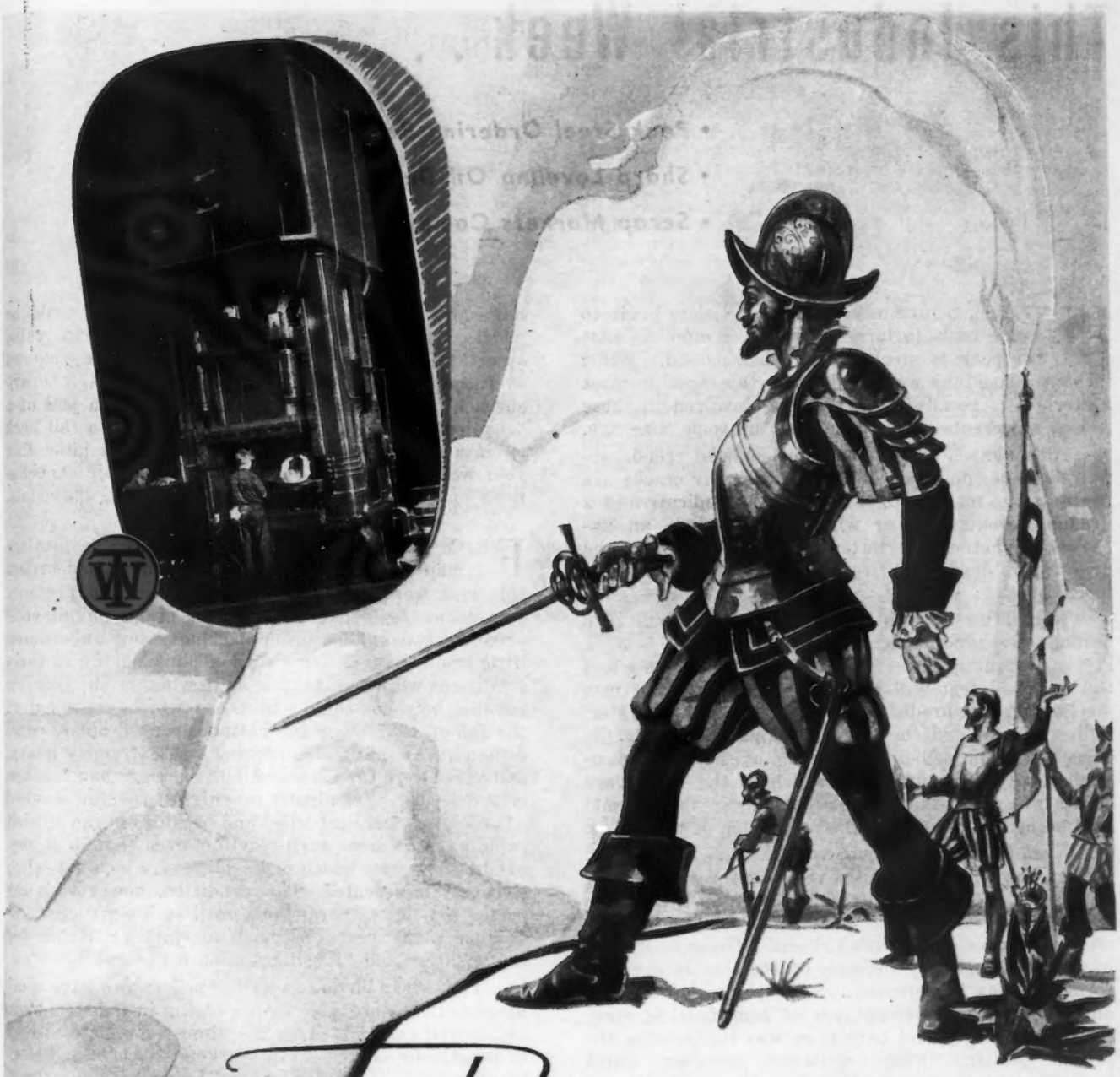
● With this issue The Iron Age returns to its former practice of quoting actual market prices rather than OPA ceilings. See page 115.—Ed.

LITHCOTE

Sir:

On the "Dear Editor" page of Aug. 17 "B. A." asks who makes Lithocote, a material for surface finishing. Perhaps he has in mind Lithcote, a corrosion resistant, non-toxic coating, made by the Lithgow Corp., 333 West 40th Place, Chicago 9.

H. A. SHERER,
Chief Engineer
Reeves Steel & Manufacturing Co.,
Dover, Ohio



Re-discovery

The war-inspired search for new methods to improve mass production often leads to that well-known source —the steel stamping process. Savings in weight, savings in material, reductions in man-hours, and ultimate lower unit cost —these have been demonstrated many times by Transue in designing for steel stamped parts for military equipment. Years of experience in deep drawn engineering and production will be available at Transue's for your postwar stamping requirements.

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This Industrial Week . . .

- ***Peak Steel Ordering Believed Ended***
- ***Sharp Leveling Off Depends on the War***
- ***Scrap Markets Completely Apathetic***

UNTIL such time as civilian steel orders begin to reach mills in large tonnages, it appears that the peak in steel ordering has passed. While incoming bookings were still heavy this week in most centers it is recalled that material involved in these orders represents requirements set up some time ago.

Although on the surface steel market trends appeared to be the same as a week ago, tiny cracks are beginning to materialize which may be indicative of a gradual levelling off or which may precede an upheaval. Whether the latter condition occurs in the near future depends entirely on the course of the war in Europe.

No matter what shape near future events take abroad, steel producer's and their consumers this week are entertaining more sober thoughts upon the affect Germany's defeat will have upon the volume of new steel orders, the production of material already in steel mill schedules and the huge backlogs. Probably the deepest thinking is being carried on by those steel companies and allied industries which in the early days of the war made the greatest changes in their plants and methods to convert to the production of war goods.

Even in steel plants where plates have been turned out, on the wide strip mills, there are a considerable number of problems involved in returning these units to their original status—that of producing various sizes and gages of hot rolled sheets. The product mix in the steel industry because of the war is not uniform company by company. Some plants are turning out much heavier percentages of semi-finished steel, plates and large steel bars than was the case in the prewar period. Other companies, however, which have wholeheartedly contributed to the production of war material find that demand for their products, necessary to carry on the fighting as well as keep essential civilian economy, follow a pattern more closely allied to peacetime production than has been the case with other companies.

SOME of the sign posts this week in the steel industry which tend to support the view that lighter demand may be in the offing are; a sharp first quarter cutback in Maritime Commission requirements, postponements in some shell steel delivery schedules, substitution of lend-lease orders for fourth quarter domestic tinplate cutbacks, hesitancy on fresh steel orders and inventory house cleaning. Even though the cutbacks in shell steel production as mentioned in THE IRON AGE last week will probably be temporary and will have to be made up at a later date, this breathing spell is giving mills a chance to catch up on structural, rail, heavy bar and semi-finished steel backlogs. The shell program had pushed deliveries on these items back to a considerable extent.

Some quarters feel that plate cutbacks should come sooner than the first quarter of 1945 so that the huge and at times unwieldy sheet backlogs could be whittled down. If backlogs on sheets, strip, rails, structurals and certain other products are reduced over the next few months because of the temporary cutback in shell production, this would mean less of a "cushion" of orders for the steel industry to fall back on if a sudden end to the war in Europe later this year would result in substantial cutbacks or cancellations on shell steel and other primary war materials.

FROM a current market standpoint and despite the many small but perhaps significant trends, orders this week were almost as heavy as a week ago, pressure was still on for deliveries involving practically all steel products and unfilled order backlogs were undergoing little or no change. Some steel officials looking at these conditions were reminiscing as to whether the possible parallel between them and those which prevailed in the fall of 1937 when the bottom dropped out of steel demand. At that time ordering was extremely heavy, deliveries were far extended, and backlogs had reached record levels. Yet almost overnight ordering levelled off, bookings were cancelled and backlogs began to melt rapidly. It is some such reaction, even though it may not be so severe, which many observers look for when Germany is defeated. This condition, however, is expected to be a temporary one until such time as reconversion plans cease being blueprints or items for conversation and "Washingtonian argument."

That scrap buyers as well as sellers also have their ideas as to the probable future easing in the steel market is well exemplified by the almost complete apathy in practically all the scrap markets this week. Prices being quoted, if anyone can be found to quote them, are purely nominal and for the most part represent either the level at which the last sales were made or a figure which sellers would be glad to base a firm commitment. It is expected that softness in the scrap markets will continue until a firmer but lower level is established and until the prewar relationships between the various grades come into being again. THE IRON AGE this week returns to its own method of quoting scrap prices since the publishing of OPA ceilings is no longer considered to be a real reflection of scrap market conditions.

The national steel ingot rate this week snapped back to 96.5 per cent of rated capacity from last week's revised rate of 95.5. Last week's decline reflected repair "troubles." District gains in output occurred in Pittsburgh, up one point to 93 per cent; Chicago, up one to 99; Youngstown, up four to 99.5; Buffalo, up two to 106.5; the Western District, up five to 83.5, and the Eastern area, up one to 94.5. Cincinnati, down two to 98, was the only steel producing center to show a drop in operations. Philadelphia at 98.5; Wheeling at 90; Birmingham at 99, and St. Louis at 106 were unchanged.

• **CONCILIATION** — According to the U. S. Department of Labor, the U. S. Conciliation Service in July disposed of 2188 cases involving 1,449,193 workers. Of this total, there were 263 cases in the iron and steel industry involving 86,387 employees. In a breakdown showing the type of situation which was disposed of, labor disputes numbering 245 and involving 85,914 iron and steel workers, classifications were as follows: 52 strikes involving 23,669 workers; 23 threatened strikes involving 5106 workers, and 170 controversies involving 57,139 workers. Other situations which were disposed of included eight arbitrations involving 209 employees in the iron and steel industry, while 62 cases covering 28,504 employees were disputes certified to the National War Labor Board.

• **WPB AND SCRAP**—Apparently the WPB is seriously worried about the reported easiness in the scrap market and the reluctance being shown by some consumers in making new commitments. The WPB claims that while currently the supply of steel scrap may not represent a problem to certain companies in the industry, the tendency for the steel industry to permit further reduction in inventories can promote a drying up of normal scrap flow and the complex sources of supply. Steel companies are warned that although declining inventories are probably anticipating an early ending of the European war, such speculations, says the WPB, involve certain hazards with respect to the maintenance of steel output to meet full military and essential civilian requirements. The WPB wobbles a little bit in its serious warning by saying that producers are not asked to purchase scrap which is not needed, but immediately straightens up again by suggesting that the Steel Division may not be in a position to guarantee a sufficient scrap supply through allocations if some companies would be unable to cope with strengthened scrap conditions.

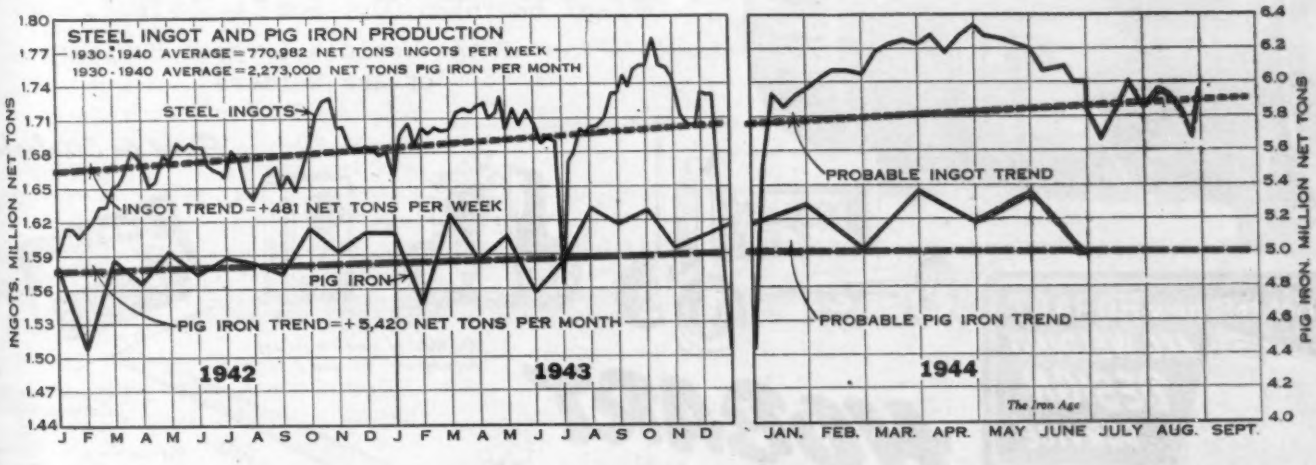
• **RECONVERSION PLANS** — Although manufacturers of civilian goods have not been able to take advantage of the WPB reconversion structure to any great extent because of labor shortages, most are said to have prepared concrete plans and are embarking on merchandising programs. Some orders, on an if and when basis, have been received by steel mills and such important industries as the automotive have advised mills that steel orders for complete production runs will be issued within one week after the green light is flashed.

• **WOMEN WORKERS**—According to the Office of War Information, in every case reported to date of group layoffs due to cutbacks or other reasons, a considerable portion of the women separated from their jobs did not seek other employment but simply faded from the labor market. Local reports show that where layoffs or cutbacks have occurred, a sizable segment of the women dismissed have not made application for other employment, even when other jobs were available in the area. A typical example of this situation occurred recently at Elmira, N. Y., when due to a cutback in bombsight production, 500 women were laid off and given certificates of availability assuring their re-employment at the same plant when another management had retooled it for other war work. Of the 500, only 160 reported for work when recalled.

• **ALLOY STEEL OUTPUT DOWN AGAIN** — Alloy steel output in July totalled 854,321 tons, about 11 per cent of total steel production during that month, according to the American Iron and Steel Institute. In July a year ago 1,066,053 tons of alloy steel were produced. Open hearth furnaces in July of this year accounted for 572,324 tons of alloy steel with the remaining 281,997 tons coming chiefly from electric steel furnaces.

• **NO VACATIONS** — Why steel operating rates which were due to plummet with the hot weather have taken only a slight dip confounds the experts. One reason labor has kept on the job is underscored by Carnegie-Illinois' announcement that at Gary Works 53 per cent of the workers, or about 9000, were paid $780,000 in lieu of vacations and that at Gary Sheet and Tin Mill 4500, or 82 per cent, took $445,000 instead of vacations. At South Chicago, 6550 employees, 52 per cent, received $525,000 for staying on the job.

• **STRUCTURAL BOOKINGS**—July, 1944, bookings of fabricated structural steel for bridge and building construction were the largest since July, 1943. The July bookings reported to the American Institute of Steel Construction by companies representing 75.6 per cent of the total average of the industry during the years 1923-1925, totaled 77,106 tons. This figure compares with 61,524 tons for June, 1944, and 56,712 tons for July of last year. July shipments for bridge and building construction totaled 33,994 tons as compared with 56,843 tons reported for the same month last year. The reported tonnage available for future fabrication at July 31 was 125,364 tons.



Steel Ingot Production by Districts and Per Cent of Capacity

Week of	Pittsburgh	Chicago	Youngstown	Philadelphia	Cleveland	Buffalo	Wheeling	South	Detroit	West	Ohio River	St. Louis	East	Aggregate
August 22	92.0	98.0	95.5	98.5	96.5	104.5	90.0*	99.0	94.0*	78.5	100.0	106.0	93.5	95.5*
August 29	93.0	99.0	99.5	99.5	96.5	106.5	90.0	99.0	94.0	83.5	98.0	106.0	94.5	96.5

* Revised

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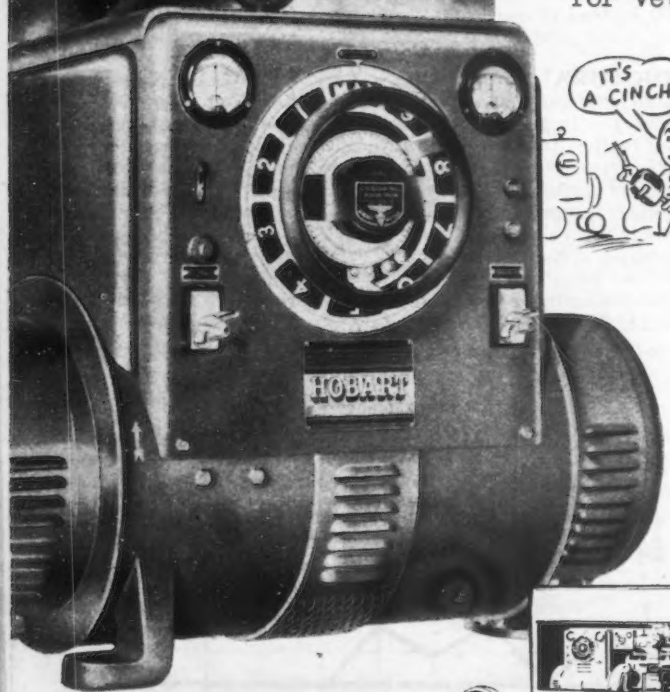

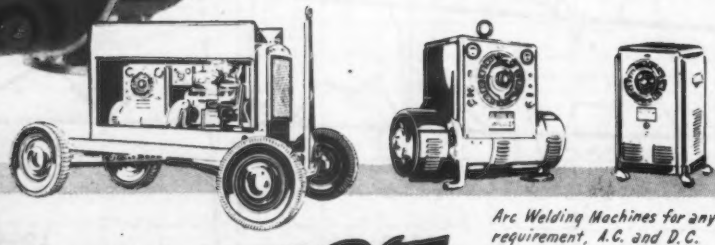

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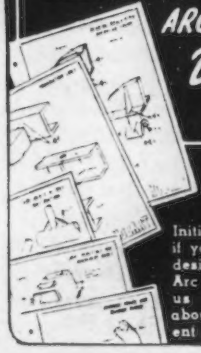

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Plans Developing for New Veteran School

New York

By S. H. BARMASEL

o o o

• • • **Representatives of New York** State industries were invited by the Bulova Watch Co. to attend a luncheon meeting at the Waldorf Astoria Hotel in New York, Aug. 21, to hear about the company's new venture in training disabled veterans to become watch repairers and perhaps to carry back to their respective companies the germ of an idea for similar plans in veteran rehabilitation. Co-sponsors with the Bulova company of the meeting were the New York State Education Commission, the Federal Office of Education, the WMC and the Veterans' Administration.

To train handicapped veterans, particularly those with leg amputations or abdominal injuries, the Bulova company under a fund set aside by the company will build a school, to be known as the Bulova School of Watchmaking, in Woodside, N. Y., just south of the company's plant. Foundations of the building have already been laid and priorities for all building materials have been granted so that the school is expected to receive its first students by Nov. 1.

At no cost to either the government or the students, the school, chartered by the New York State Board of Regents, will train those selected by the Veterans' Administration to take jobs as repairmen in retail jewelry stores. Living expenses, however, will be paid by the government under the so-called G.I. Bill of Rights. Bulova has already received over 1000 pledges from its dealer outlets and other retail jewelers to employ graduates of this 12-month course, thus assuring jobs to students for the next four years. It is not the company's intention to train men in this school for employment in the Bulova plant.

The course of study which depends mainly on visual education through the use of eight motion picture films and slides is divided into two parts, a 12-month course in watch repairing and a two and a half year course in master watchmaking modeled after the Swiss system. Heading this new trade school is Howard L. Beehler, former president of the Horological Institute of America. About 250 veterans can be handled at any one session with one instructor for each 15 students.

After hearing the details of the Bulova plan, the 100 industrialists present were urged by Oakley Furney, assistant State Commissioner of Education, either to establish vocational training schools or to cooperate with public schools in their communities in rehabilitating veterans. New York, he said, has neither sufficient school buildings, equipment nor teachers to train even 10 per cent of the million and a half men under arms from the state. Before the war, New York's public, trade, technical and agricultural schools could handle only 125,000 boys and girls. "If industry does not cooperate, I don't know how the task of rehabilitation will be accomplished," he said.

• • • "Workers should be classified as normal with handicaps and normal without handicaps. Although many physically handicapped persons do have psychological maladjustments, with proper guidance they can be overcome.

"In handling a handicapped worker, you must not consider what he has lost but what he has left. He is hired for his ability, not his disability.

"A handicapped individual when properly placed in a job is not a handicapped worker." —Mike Suppa, supervisor of handicapped workers, International Business Machines Inc.

"We must salvage human beings the way we have salvaged materials during this war."— John A. McCarthy, deputy Commissioner of Education, New Jersey.

Other speakers at the meeting emphasized that training alone does not complete the job of veteran rehabilitation. The program has two other equally important phases, that of counseling and placement. Personnel guidance clinics have already been set up in New York State where professional advisers after administering psychological and aptitude tests will help veterans find their vocation.

But in addition to providing vocational guidance for veterans, jobs in plants must be analyzed as far as physical demands and necessary skills are concerned. Physical demand charts have been worked out and are available from local USES offices. There is probably no job that requires every physical faculty and by determining the physical demands of each job, the training and employment of disabled veterans will be facilitated.

No Need Now for WPB Approval for Equipment

Washington

• • • **Producers of capital** equipment including machine tools, precision, measuring and testing instruments, electronic motors and generators and other general industrial equipment need no longer obtain WPB permission to begin production on unrated purchase orders for such equipment placed under priorities regulation No. 24, WPB announced on Tuesday.

This action, WPB said, has been taken to simplify procedure which must be followed by capital equipment manufacturers in accepting purchase orders for items which will be needed to bring about an early resumption of civilian goods production. It was pointed out that this change which is contained in Pr. No. 24 as amended Aug. 28 does not affect the provision of the regulation that requires purchasers of machine tools and other equipment to obtain specific WPB approval before they place an unrated order.

Persons desiring to place unrated purchase orders for the items covered by list A of Pr. No. 24 will continue to apply for approval to do so by filing a letter in triplicate with their nearest WPB field office giving a description of the equipment including make, type, size and approximate price.

Special Report to Industry On War Production and "Reconversion"

By DON BROWNE

Madhouse on the Potomac—

This is a serious report, and any semblance to fact is purely coincidental. War production is good, lousy, magnificent, terrible, slightly off. There is no shortage on the battlefield today. Tomorrow, a theater commander will be short 1000 1-ton bombs.

Steel is short and easy, and so is manpower. No serious cutbacks are in prospect before the war with Germany ends, but about 300,000 workers will be released before December. No, sorry, it was only 129,000.

WPB Chairman Donald M. Nelson is going to China for three months—two months—well, maybe three weeks. . . . Mr. Nelson has resigned. No, he hasn't, it's Mr. Wilson. "There is absolutely nothing in the rumor that Charlie Wilson and I are anything but the best of friends," said Mr. Nelson. "I agree with Don," said Mr. Wilson.

Donald M. Nelson wins the reconversion battle over the Army and Navy. Lieut. Comdr. Krug is made acting chairman of WPB. Nelson is in, Nelson is out. He is up, he is down. It's "Iffy." President Roosevelt says he does not know whether Mr. Nelson will return to WPB, so the Daily Press correspondents report.

Business correspondents have to get their White House dope indirectly. That's so because the business press has been tossed out of the President's conference. To make wacky reports wackier, it is said that Lieut. Comdr. Krug, despite his rank and uniform, is an "Army man," and a loyal New Dealer. And to cap this screwiness it is said that acting Chairman Krug is impartial, and is well liked and respected by private utility men he came in contact with as the former head of the Office of War Utilities and at TVA. Actually, Krug is a middle of the roader. There are 700,000 unemployed, and believe it or not, various government agencies report all the way up to 3,000,000 men out of work.

Reporter: "What about reconversion, General?"

General: "Did you say sabotage—I mean reconversion?"

Reconversion will make people think the war in Europe is going to be over soon, and make workers think about getting jobs in civilian industry. But if workers know that there are going to be plenty of jobs as soon as cutbacks become serious, they will stay on war jobs until no longer required.

Big business is against reconversion and little business is for reconversion. Small business representatives have told WPB they don't want to be squeezed out of profitable war business first.

The War Department is against reconversion. Yet the Army surplus forces are busily calling in industry groups and telling them how cutbacks will affect them.

The War Department is for reconversion. Yet military men oppose all four WPB reconversion orders, and the spot authorization plan in particular. Timing seems to be in the dispute.

The Army has a vast oversupply of munitions, yet theater commanders complain that they are shy of needed bombs, trucks, and shells.

The Army buying policy, so anti-New Dealers say, is geared to the president's drive for r e e l e c t i o n — — — not too much unemployment before election, nor too many cutbacks. Airplanes were cutback, to result in the lay-off of 300,000 workers before December.

The Senate Defense Investigating Committee headed by Senator James M. Mead of New York—a loyal administration supporter—is investigating the Army Supply Program. . . .

Against all political prophecy, the Mead committee is expected to turn up observations and recommendations which are critical of the administration. Current investigations may result in the following criticisms:

1. Reconversion should come as quickly as possible.
2. There is no manpower shortage.
3. DPC is not moving fast enough to publicly list plants and machinery which will soon be out of war production—so interested capital can plan on buying them then.
4. The War Department should not pay for combat damages nor junk and burn serviceable military equipment.
5. The State Department and FEA are not always advised of War Department disposition of foreign surplus property and this practice should be discontinued.
6. Neither the Army nor FEA know the extent of military stocks abroad, and FEA should find out.
7. FEA, Lend-Lease and the War Department should get together and balance all United States financial contributions against claims for reverse lend-lease, damages, and other debts owed foreign countries.
8. SWPA should get RFC out of the agricultural, grazing and mineral land field because RFC is not suited to do this and has its offices mainly in financial and production centers.

Demands having leveled off, WPB has removed allocation control over beryllium copper. Brass mills may obtain beryllium copper requirements directly from beryllium producers without allocation.

Dangling if not dazzling figures ranging from $10,000,000,000 to $250,000,000,000 an unimportant difference in these days of federal decimals, have been glibly mouthed as the amount of surplus property that has piled up to stratospheric heights.

LARGEST NAVY BLIMP: *The Navy's newest and largest blimp, the M-1, hovers over the earth in a test flight. Built by the Goodyear Aircraft Corp., the M-1 is the first blimp to use the fully controlled and reversible propellers similar to those used by huge flying boats.*

Calls Nelson's Reconversion Plan More Puzzling Than Workable

Cleveland

• • • Climaxed by an impending trip to China, Donald Nelson's reconversion planning appears to be more of a Chinese puzzle than a workable plan which would permit orderly reconversion at this time, observations here among industrialists indicate.

Some industrialists applaud the system as it is now pointed out that the more stringent and impossible the limitations are when first imposed the less likely they are to stand the pressure. And the pressure to reconvert is tremendous. The question on everyone's lips is "How long will these controls remain?" At present this rests with reconversion legislation which is as yet unborn. Plans to discontinue restriction within one year after the end of the war are spawning in Washington. Clevelanders want to know . . . "End of what war?"

In addition to all the holds which are at present in effect the WPB is strongly advising each applicant for civilian production to be sure that every needed commodity can be obtained since no priority assistance or financial security can be offered by WPB even though the go-ahead on civilian production is granted to a firm.

WPB asks that every potential applicant check carefully to see that he has the buildings, facilities, all necessary components, raw materials, cartons or crating, labor supply and finances already on hand or in sight as WPB can be of only minimum assistance and financial loss may result from going ahead without first assuring the supply of all these items. No higher than an AA-5 can be granted to get parts or materials and no building or facilities permits can be rendered as assistance to reconversion production.

Here is the way the system works: The hopeful manufacturer starts out by deciding that he wants to make a specific product or line of products and checks over all of the points previously mentioned as WPB cautions. On WPB 4000 he certifies that he has sufficient buildings, machinery, materials, components, cartons, and is aware of the financial risk. On another Form WPB 3820 (revised) he specifies the amount of labor he will require for the production and the amount he has, etc. Tied in with this revelation will be full information as to what war contracts he has, what type he could still assume, why he isn't taking them on and other soul searching information.

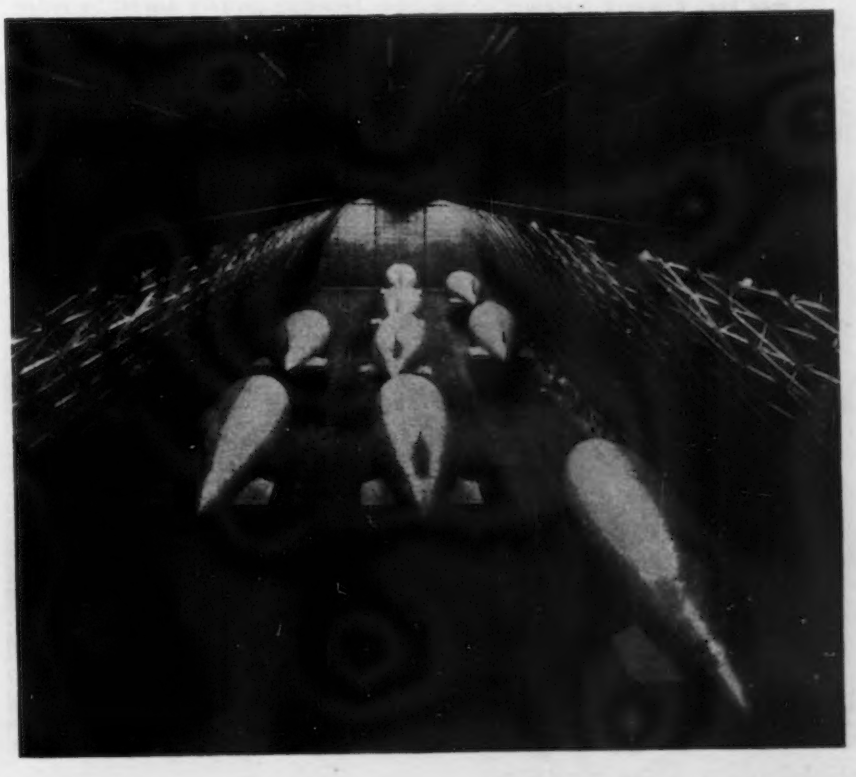
Then the two forms with a letter of application are turned over to the WPB processing analyst who sends the 3820 to the War Manpower Commission and meanwhile pores over the WPB 4000 himself. All of the questions as to facilities, materials, etc., must be answered satisfactorily. The product to be made must be a preferred utility product and if any question of doubt turns up the OCR is called in to draw the line. This decision alone can throw the application out. So can any of the other factors included on the 4000 form.

But that's not all. Meanwhile the 3820 form has reached the War Manpower Commission which must pass on the availability of labor. If WMC believes the labor can be spared, which seems unlikely since manpower movement from loose labor areas to tight ones is being used to soap up excesses rather than apply them to civilian production, the application then goes to the Area Production Urgency Committee where it is joined by the facilities statement now known as "old 4000."

Here old 4000 and 3820 (revised) meet under the scrutiny of the APUC. The purpose of this group is to find something other than civilian production which can be done by the applicant's facilities, material and manpower . . . if he has proved these points thus far. Here the military gets a chance to say "why couldn't he make this whichit for us?" And nine chances out of ten he will end up with a new contract for whichits because the military needs a million of 'em. Smaller War Plants Corp. also has a chance to slide in a bit of small job work of a war nature even if the application has had the grace to elude all of the other obstacles placed in its way. Since it's pretty hard to keep those SWPC contract placement figures built up to a respectable total this effort should be very serious and the application's chances should be growing extremely thin.

Somewhere along the line the WPB Redistribution Branch is also called into the picture to see if excess material could not be palmed off instead of new material. The WPB Production Service Department also gets a crack at deciding whether the product is legitimate or not according to the L and M orders still in effect.

HOME TO ROOST: *U. S. Navy training blimps nestle in their hangar at Moffett Field, Cal. To illuminate this hangar, which is* 1000 *ft. long,* 300 *ft. wide, and* 175 *ft. high,* 42 *Westinghouse* 3000*-watt mercury lamps are used in porcelain enameled steel reflectors.*



Navy Has Become Biggest User Of Surplus Property Storage Space

Washington

• • • **Biggest Government user** of storage space for surplus property, now piling up in large quantities, is the Navy. Not the Army, as might be suspected, but the Maritime Commission comes second. RFC ranks third and the Army rates a poor fourth, kept out of the cellar only by the Treasury.

Figures revealed by Surplus War Property Administrator W. L. Clayton in locating storage space and allotting it to Government agencies show that a total of 2,860,000 sq. ft. of space has been accepted by the foregoing branches. Broken down, the score is: Navy, 1,553,000; Maritime, 571,000; RFC, 471,000; Army, 190,000; Treasury, 75,000. This amount will be upped and is but a little over half of 5,543,000 sq. ft. requested. Space is allocated by regional subcommittees of the SWPA Space Control Committee (first come—first served.)

Among the matters under consideration by the Washington committee is that of central warehousing. This involves central storage in an area for particular types of property; for instance, steel products would be concentrated in one space, copper in another, typewriters in another, etc. This obviously would facilitate disposal, Mr. Clayton said. It becomes particularly important that the owning and disposal agencies cooperate closely on central storage in connection with termination inventories and plant clearance, otherwise the owning agency is likely (if immediate plant clearance is required) to store wherever immediately convenient, he added. And if central storage is later desired by the disposal agency, it will involve further handling, transportation and storage before final disposal.

Another manner that will be stressed is the advisability, in disposing of surplus property, of taking into consideration the costs of transportation and storage in deciding the adequacy of the price offered by a prospective purchaser, Mr. Clayton said. In other words, if a price offered for surplus property seems inadequate and out of line with normal expectations, it is important to compute the cost of alternative storage.

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Ask WPB Division Directors to Examine and Review Stockpile Program

Washington

• • • **WPB last week** announced that all of its division directors have been asked to re-examine their stockpile and public purchase programs and to review their estimates of proper reserve stocks for each program. Deputy Executive Vice-Chairman Arthur H. Bunker said that the principal objectives of the reserve stock policy today should be to provide against interruptions and declines in production which may develop from the tight manpower situation, to add some margin of safety to take care of unforeseen developments internationally and to lay such plans as may possibly avoid inordinately large stockpiles when the war ends.

As a general yardstick, a safe reserve stock is now regarded as one equalling either three months' total requirements or six months' import requirements, whichever may be larger. Many variations from this yardstick will have to be made, it was pointed out.

There are certain materials which place them outside any general overall policy yardstick, Mr. Bunker explained. In such cases, he said, the safe margin of reserve should exceed normal requirements.

After the industry divisions have prepared revisions of their stockpiling programs in the light of the new policy, their recommendations will be reviewed by the Mineral Resources Operating Committee, the Leather Bureau Stockpile Advisory Committee and a third committee set up by the Office of the Operations Vice-Chairman.

Reserve stocks are defined as the amounts in excess of ordinary working inventories of both producers and consumers as determined by industry divisions concerned. They include any industry stocks in excess of working inventories, plus domestically-held government stocks of raw materials, whether owned by the RFC, Treasury Procurement or the Armed Forces.

MECHANICAL FACIAL: *These British mechanics spruce up a bulldozer at an RAF mobile workshop in New Guinea. Stripped down to their waists, the men keep damaged machines of war from becoming entirely useless by repair on the spot.*

Sets Uniform Procedures For Financing Cancelled War Contracts

Washington

• • • **In his first general** regulation as Director of Contract Settlement, Robert H. Hinckley, last week prescribed uniform procedures for Federal Reserve bank guarantee of termination loans (T-loans) made by commercial banks to contractors whose war contracts are cancelled. Simultaneously, Chairman Marriner S. Eccles of the Federal Reserve System appeared before the House Banking Committee and recommended legislation establishing a Government guarantee system for business loans for postwar expansion of private enterprise. The program would extend into the reconversion period the "V" loan system used in war production financing. Mr. Eccles said that such a guarantee would not be competitive with the private banking system and declared that the Federal Reserve System now is in position to guarantee the proposed loans up to $500,000,000 without any new appropriation.

The procedures promulgated as Regulation 1 of the Office of Contract Settlement were formulated by a committee made up of representatives of the War Department, Navy Department, Maritime Commission, Federal Reserve Board and approved by the Contract Settlement Advisory Board.

Mr. Hinckley said that to speed up the granting of small loans in the field, the Federal Reserve banks, as fiscal agents, have been authorized to approve T-loan guarantees totaling $500,000 or less to a single borrower.

The regulation states in part:

"The requested percentage of guarantee should not ordinarily be questioned by the Federal Reserve bank or the contracting agency if it does not exceed 90 per cent; and a contracting agency should not authorize a percentage of guarantee in excess of 90 per cent, or 95 per cent in the case of small loans, unless the circumstances clearly justify the financing institution in requesting it and other means of interim financing are not promptly available.

"The borrower's certification of his investment in termination inventories and receivables and amounts payable to subcontractors should not be questioned by the Federal Reserve bank or the contracting agency unless there is reason to believe it is substantially overstated in value."

Accompanying Regulation 1, the Office of Contract Settlement made available the texts of its standard T-loan guarantee agreement, termination loan agreement and explanatory notes with reference to these agreements.

In his testimony before the House Committee, Mr. Eccles said that a borrower would be expected to apply for a loan through his usual banking connection, which in turn would apply to its district Federal Reserve bank for the guarantee. The guarantees would not exceed 90 per cent of the amount of the credit.

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WLB Accepts Stabilized Wage Rates

Rockford, Ill.

• • • **Final acceptance of** stabilized wage rates for tool and die workers in this area has been made by the Sixth Regional War Labor Board following a report of the Board's wage rates committee that rates set are "justified under the stabilization principles applied to tool and die work."

Wage brackets as defined by the Board set rates for job shops from $1.40 to $1.70 an hr. and for captive or production shops from $1.25 to $1.55 an hr. For those plants which have flat rates, the mid point of these ranges shall be used which will be $1.55 an hr. for the job shops and $1.40 an hr. for the captive or production shops.

These rates were set by the Board for the entire six state midwestern region, except for Chicago and South Bend, Ind., where the ranges are 5c. an hr. higher. The Rockford shops had protested the stabilized rates, and the wage rate committee had the protest under consideration for several weeks.

Under application of stabilized rates, approval usually is given by the board to voluntary applications for rates up to the stabilized ranges, although WLB approval is necessary. Companies paying rates equal to or in excess of the stabilized rates ordinarily are not permitted to increase rates. Voluntary application must come from the company, if no union is involved, or from the company and union if there is a union.

THE OLD SQUEEZE PLAY: *Somewhere in France, this 2½-ton Army truck is caught between sections of a bombed-out bridge. The accident occurred at night when the driver continued over the bridge not knowing that it had been bombed.*

Lieut. Comdr. Krug Replaces Wilson As Acting WPB Chairman

Washington

• • • Lt. Comdr. J. A. Krug, former WPB program vice-chairman, was chosen by the President last Aug. 24, to take the place of WPB Executive Vice-Chairman Charles E. Wilson who resigned because of a row over reconversion with the board's chairman, Donald M. Nelson.

Mr. Wilson's resignation was announced by the President on the eve of Mr. Nelson's departure for China "on a confidential mission of great delicacy."

The departure of Mr. Nelson plus the resignation of Mr. Wilson made it necessary for the President to appoint someone to take over WPB's leadership immediately inasmuch as the feud of the two top men threatens the agency with further confusion and damage to employee morale.

Acting Chairman Krug is known to be a middle-of-the-roader who gets along equally well with the military services and Mr. Nelson. He is expected to hold the jittery WPB organization together while Mr. Nelson is away.

The President said that he accepted Mr. Wilson's resignation with great reluctance, and commended him for the great job done in the past two years in solving production troubles in aircraft and shipbuilding.

Credited with cracking the bottleneck of components through scheduling, Mr. Wilson successfully occupied the main operating job in WPB, while as long ago as last December he had asked the President to release him from his duties to return to private industry.

Mr. Wilson is president of General Electric Co., and is expected to return to this position.

Industrial Materials Comprise 21 Per Cent of Total Lend-Lease

Washington

• • • Industrial materials and products worth $6,000,000,000 have been lend-leased to the United Nations, according to the 16th report on lend-lease made to Congress by the President on Aug. 23.

This torrential outpouring of machinery and materials represents 21 per cent of goods lend-leased since March, 1941, the total value of which amounts to more than $28,000,000,000.

The President reported that iron and steel exports in the years beginning Jan. 1, 1942, and ending December, 1944, were 10 per cent of total output by dollar value in 1942, and 8 per cent of the total dollar value of production in 1943 and 1944.

These figures include both lend-lease and direct purchases.

On the same basis, machinery exports were 7 per cent in 1942, 13 per cent in 1943, and about 18 per cent in 1944.

Non-ferrous metal exports were 13 per cent in 1942, 19 per cent in 1943 and more than 20 per cent in 1944.

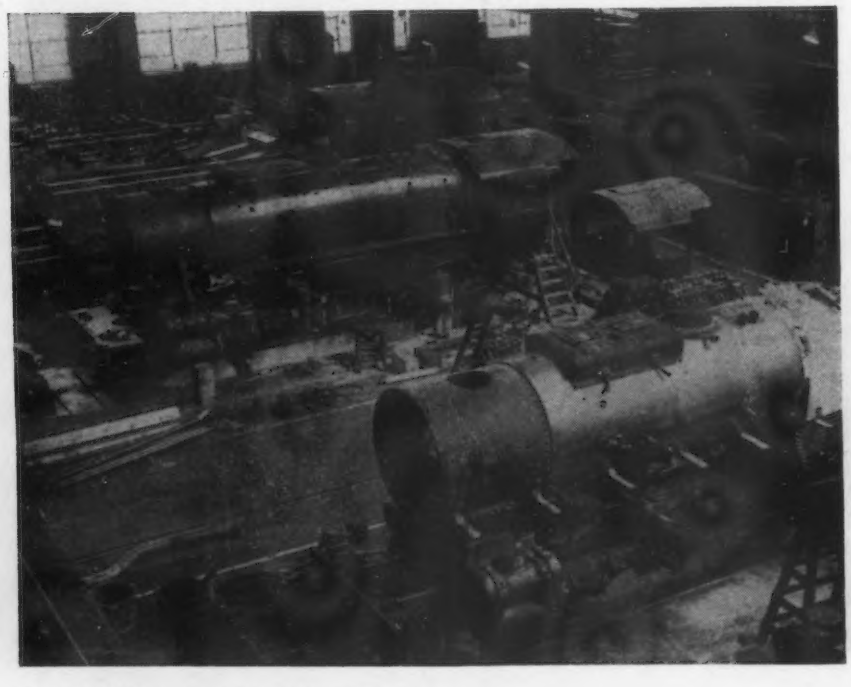
The value of lend-lease exports to all countries in thousands of dollars together with the percentage exported to each group of recipients is as follows:

Lend-Lease In Thousands of Dollars

Country	Percentage	Value
United Kingdom	43.3	$9,321,549
U. S. S. R.	27.5	5,931,944
Africa, Middle East & Mediterranean Area	14.3	3,070,829
China and India	6.5	1,402,426
Australia and New Zealand	4.7	1,011,885
Latin America	0.8	171,970
Other Countries	2.5	624,267

In the four prewar years, 1935-38, total United States exports averaged less than $2,800,000,000, according to the report. United States cash exports between March, 1941, and June, 1944, totaled $10,900,000,000, approximately half as much as the lend-lease exports in the same period.

The President made the amazing statement that in the first six months of the year commercial exports, exclusive of lend-lease were in excess of an annual rate of $2,800,000,000.



Miller Elected President EME

Chicago

• • • James H. Miller, superintendent of the electrical department, Wisconsin Steel Co., has been elected president of the Electrical Maintenance Engineers of Chicago. Harry G. Buckles, chief electrician, Ingersoll Steel & Disc Co., becomes vice president.

Cast Armor Plant Opens At East Chicago to Feed Tank Program

Chicago

• • • **Production of cast armor** at the East Chicago. Ind., plant of American Steel Foundries was renewed here Aug. 28. Reopening of this big plant, built to feed the tank production program was necessary because of the renewed production emphasis on tanks. The plant which originally began operation in October, 1942, ceased production last May and was put in a standby position (see page 77, June 1, THE IRON AGE, Great difficulty in resuming operations is expected because the plant's labor force scattered to other steel plants in this highly critical labor area when the plant was closed. Workers are reported skeptical of continued employment with the reopening. Approximately 2,000 are needed before full production can be resumed.

Canada Sees Relief for Steel Supplies

Toronto

• • • **Some relief appears to** be developing with regard to increased supply of steel for non-war industry. However, with the exception of the agricultural implement industry no wide scale production of civilian goods has been started. It is stated that there is a possibility that the automotive industry is getting ready to swing over to production of passenger cars and one plant is said to be tooled and ready to go at the beginning of 1945. Makers of railroad cars and locomotives have been favored with a substantial increase in steel supply and are maintaining virtual capacity operations, and have arranged for continuations of this rate into 1945 on production of post-war equipment.

Announcement was made recently that Canadian Pacific Railways Co. has placed orders for 1,150 freight cars to replace rolling stock which has suffered from the desperate urgency of wartime transportation. The new orders include 750 steel-sheathed, 50-ton box cars to be made by Canadian Car & Foundry Co., Ltd., Montreal; 200 overhead refrigerator 50-ton cars, the order placed with National Steel Car Corp., Ltd.. Hamilton; and 200 drop-end, 70 ton gondola cars to be built by Eastern Car Co., New Glasgow.

First delivery on the 2,140-car order for Canadian Pacific Railway placed last January, was started recently." This order was distributed as follows: Canadian Car & Foundry Co., 1,000 box cars and 100 triple hopper cars; National Steel Car Corp., 500 drop-end gondolas, 300 triple hopper cars and 140 refrigerator cars; Eastern Car Co., 100 coal cars. While delivery is proceeding on the January orders and will continue into 1945, no delivery of the new orders will be made until next year.

SWPC and Services to Meet with Prime Contractors

Washington

• • • **Under the joint** sponsorship of the Smaller War Plants Corp. and Army and Navy procurement officers, meetings of subcontractors and smaller prime contractors will soon be held in all parts of the country, it has been announced by those agencies. The purpose of the meetings is to interest contractors in making preparation for contract settlement and to convey basic information on the principal elements of contract termination procedures. Recent surveys have shown that war contractors are generally tardy in submitting their claims for settlement.

Under the agreement, the SWPC field offices will cooperate with the armed services and civic bodies in sponsoring and arranging the meetings. The program will be in charge of Army and Navy procurement officers and will include subjects as: explanation of the Contract Settlement Act; the subcontractor's claim; Interim finance; SWPC's services on contract settlement; settlement procedure by the Army and the Navy Department; and plant clearance of excess property. At all meetings a question-and-answer period will be held with queries from the audience to a panel made up of the various Army and Navy representatives.

COMING EVENTS

Sept. 10-13—National Metal Trades Association, Lake George, N. Y.
Sept. 25-27—Association of Iron and Steel Engineers, Pittsburgh.
Oct. 5-7—SAE National aircraft engineering & production meeting, Los Angeles.
Oct. 5-7—National Electronics Conference, Chicago.
Oct. 5-6—AIME Electric furnace steel conference, Pittsburgh.
Oct. 10-11—Gray Iron Founders' Society, Inc., Cincinnati.
Oct. 12-14—The Electrochemical Society, Inc., Buffalo.
Oct. 16-20—National Metal Congress, Cleveland.
American Society for Metals.
American Welding Society.
Society for Experimental Stress Analysis.
American Institute of Mining & Metallurgical Engineers, Iron and Steel Division and Institute of Metals Division.
American Industrial Radium and X-Ray Society.
Nov. 2-3—Industrial Management Society, National Time and Motion Study Clinic, Chicago.
Nov. 27-Dec. 2—National Exposition of Power and Mechanical Engineering, New York.
Dec. 4-6—SAE National air cargo meeting, Chicago.

Recommends Deferment For Certain Men Under 26

Washington

• • • **WPB has recommended** draft deferments for 463 men under 26 years old who are considered highly important in steel production, it was announced recently by Norman W. Foy, Steel Division Director.

Cognizant of the need to maintain steel production at high levels and of the large number of workers under 26 who are being inducted into the military services from this industry, the Inter-Agency Committee early in July recommended that deferments be obtained for about 500 steel men under 26.

These men were selected from lists submitted by producers of coke, pig iron, steel ingots, semi-finished and finished steel. Each company had been directed to list not more than 8 per cent of its draft-eligible employees under 26 years old. Steel division screened these lists and has so far selected 463 men for deferment. Mr. Foy said that prior to the action of the Inter Agency Committee, the bulk of workers under 26 in the steel industry had been taken into the armed forces. The steel division transmitted the deferment recommendations to WPB state field representatives, whose job it was to certify the deferments to individual draft boards involved.

Major Coal Strike Threatens; Strike Vote Elections Scheduled

Pittsburgh

• • • **Threatening again to sharply** cut into steel production is the probability of another coal mine strike on a national scale. The National Labor Relations Board headquarters in Pittsburgh reported Aug. 25 that it had a total of 68 strike vote elections scheduled from Aug. 30 to Sept. 7 at the various coal mines in western Pennsylvania, West Virginia, Ohio, and Kentucky. The general feeling is that if the mines don't actually go on strike before the elections, the elections will throw them out. The tentative schedule for strike vote elections, subject to some additions, is as follows:

Date	No. of Elections Schedules
Aug. 30	5
Sept. 1	6
Sept. 2	10
Sept. 5	20
Sept. 6	14
Sept. 7	13

While coal production in the western and central Pennsylvania districts has already been cut sharply by strikes that occurred during the past week, there is yet no indication of an effect on steel production. It is estimated that close to 40,000 tons of coal a day are being lost by these strikes, which have shut down about a dozen mines.

The kernel in the nut of dissension at the mines is the union organizational drive by the United Clerical, Technical, and Supervisory Workers of the Mining Industry, District 50 of the United Mine Workers. This organizational drive is aimed at unionizing mine employees in foremen and supervisory capacities and the clerical help associated with mining operations.

The WLB ordered the strikes already in progress to be called off, but the order was ignored and plans for strike votes are being carried on. It was reported that John McAlpine, president of the UCTSWMI-UMW, was ordered by the War Labor Board, in a call for a meeting of the leaders of the strike, to appear at the hearing and explain the reasons for the strikes, but he disclaimed any knowledge of the order.

Mines struck by the supervisory employees union are; five mines of the Rochester & Pittsburgh Coal Co.; two mines of the Ford; a mine of Jones & Laughlin Steel Corp.; one of the Heisley Coal Co.; and mines of the Pittsburgh Coal Co., Jamison Coal & Coke Co., and Crucible Steel Co. The strikes at the mines of the latter three companies were called off, production being resumed on Aug. 24. At the No. 5 Vestaburg mine of the Jones & Laughlin Steel Corp., strikers tied up coal production from Aug. 21 through Aug. 23, resumed operations on Aug. 24, and then went out on strike again on Aug. 25.

The pattern of the strike at Vestaburg sounds a familiar note, being typical of the instigation of coal strikes in the past. At this mine, the miners themselves went out on strike, refusing to work under non-union supervisors. Through the aid of UMW, this strike was called off and mine production was resumed on Aug. 24, but on Aug. 25 as the miners were about to enter the pit, a union organizer, Joseph Morovitz, protested and called another strike. At this point, the miners began to get a little vicious, and attacked one of the non-union supervisors. The strike was again resumed with picket lines at the mine. Such strike tactics are nothing new, having been exercised many times in the past with little variation.

Analyzing the coal supply situation of the steel mills in the Pittsburgh district, it was revealed that the situation is not by any means too comfortable. Industrial stocks of coal are quite limited. Stocks of by-product coal are set at about 15 days' supply, while stocks of coal for steam making purposes are set at about 40 days' supply. Consequently, if a coal strike of any duration is called, steel production might easily be hurt long before the 15-day period, since transportation, coal handling, and other factors hinging on working from depleted stocks may well slow up the movement of coal to points of actual consumption.

Allotments for Carbon and Alloy Steel

Washington

• • • **Requirements and WPB** allotments in net tons for carbon and alloy steel for the third and fourth quarters of 1944 for some of the more important claimant agencies, including corrected figures for those published in THE IRON AGE of Aug. 24, page 94, follow: (000 omitted)

	Third Quarter, 1944				Fourth Quarter, 1944			
	Requested		Allotted		Requested		Allotted	
	Carbon	Alloy	Carbon	Alloy	Carbon	Alloy	Carbon	Alloy
Aircraft Resources Control office	127	326	122	304	115	286	115	285
Army	3,113	648	3,259	648	3,996	709	3,780	648
Navy	1,663	511	1,633	479	1,502	411	1,493	411
Maritime Commission	1,986	12	1,900	11	2,029	7	1,800	7
Foreign Economic Administration	1,231	69	1,020	55	1,059	88	956	76
Canada	357	33	333	25	364	25	343	25
War Food Administration	1,066	21	1,041	21	943	17	832	17
Petroleum Administration For War	462	101	372	100	364	97	353	87
Office of Defense Transportation	1,477	98	1,263	97	1,470	148	1,039	105
Office of War Utilities	275	16	245	16	193	17	144	16
Office of Civilian Requirements	231	6	236	6	262	5	215	3
Operations Vice-Chairman Metal and Minerals	3,239	512	2,982	472	3,177	469	2,945	445

DPC Aluminum Foundry Closes at River Rouge Works

Detroit

• • • **The DPC-owned aluminum foundry** plant in operation at the Ford Motor Co. River Rouge Works has been closed down.

This plant was a production operation on aircraft cylinder heads and muffs. It was built since the beginning of the war and operated for a considerable period at high manufacturing rates.

Its shutdown appeared due to enlarged use of forged cylinder heads, rather than cast components.

Calls Current Surplus Property Legislation in Congress "Stop-gap"

Washington

• • • "Stop-gap" is the word being applied to surplus property legislation now pending before House and Senate conferees, since the Senate passed the Murray-Johnson-Taft-Steward bill last Friday. The Colmer bill, written by the Surplus Property Administration, passed the House on Aug. 22.

The reason many legislators and government lawyers think both bills unsatisfactory is that practically unlimited regulatory discretion is granted S.W.P.A. Adminstrator Clayton with no adequate standards provided either to assist Mr. Clayton or to safeguard the interests of government and industry.

Despite the fact that the Senate bill was passed nearly unanimously, only a handful of Senators was present at any time on the Senate floor.

"I would rather not have any legislation until we get more experience in handling surplus property," Mr. Clayton told the IRON AGE on Aug. 28. He added that he thought the Colmer bill superior to the Senate surplus property bill "because we wrote the House bill."

One Senator said that it doesn't make any difference what conferees do with the legislation because both bills are "full of politics and not policies."

Both bills would require the proceeds from the sale of surplus property to be used to reduce the national debt. However, conferees face the necessity of compromises on widely divergent provisions.

The House measure places administrative responsibility under a single administrator, while the Senate puts property disposal under an eight-man board. The House once rejected such a proposal.

The House bill ratifies what S.W.P.A. already is doing, and both bills give it a relatively free hand. Exceptions in the Colmer Bill are that reports would be required on the sale of aluminum and synthetic rubber plants, and pipe lines costing more than $5,000,000. It would require the administrator to obtain approval by an 18-man advisory board before disposing of any plants costing more than $1,000,000.

The Senate bill would require reports to Congress on plans for disposal of aluminum, magnesium, rubber, chemical, aviation gasoline and iron and steel plants, pipelines, patents, processes, techniques and inventions.

While the House would give the authority over land sales to the administrator, the Senate would place it in the hands of the interior and Agriculture Departments. Both measures would give priority to former owners and would require disposal of farm land in single-family units wherever possible.

The House would give municipalities priority in purchasing or leasing airports. It rejected proposals to give advantages to institutions or governmental units in the acquisition of other surplus property.

The Senate, however, authorized property donations to public schools, and permitted a 50 per cent discount in sales to states, their political subdivisions, and tax-supported or nonprofit institutions.

Both chambers attempted to safeguard small business. The House measure would require sales in the smallest possible lots, and give small business priority. The Senate Bill would give the Smaller War Plants Corp. power to protect small business, including authority to buy surplus property for resale to little business men.

Salutory provisions requiring early classification of plants and machines in the plants of a private contractor are contained in the Senate bill. The services would be required to classify termination inventories prior to termination of contracts, as well as plants and machines.

The government would have to indicate plants and machinery intended for sale and which the government intends to retain for standby purposes, what material is to be scrapped and what material is to be sold.

The Senate bill prohibits government competition with private industry in any of the government owned plants, and also the re-entry into the United States of any surpluses exported or disposed of abroad.

Neither bill requires the maintenance of up-to-date continuous inventory of all government owned property, regionally and centrally.

Industry Censured On Surplus Disposal

Washington

• • • Reports of industry's apparent indifference to disposal of huge quantities of surplus property was brought to the attention of Surplus Property Administrator Will L. Clayton on Aug. 28. Conflicting surplus property bills have been passed by both the House and the Senate and are now in conference.

Agreeing with these reports, Mr. Clayton said he did not believe industry has given enough study to the question, or sufficiently organized its ideas.

Staff members of the Senate Small Business Committee report that no industry except the machine tool industry has come forth with concrete surplus disposal plans.

WLB to Hear Castings Cases

Washington

• • • Fifty-three steel castings companies have been assigned to be heard before the basic steel panel of the War Labor Board, a WLB spokesman said on Aug. 29. No separate panel will be appointed it was said, despite the fact that the castings industry has requested it.

The basic steel panel will report to WLB its findings in the main case of USWA's demands against the steel industry.

Meanwhile 500 fabricating companies presented the first part of their case against the USWA demands to a new miscellaneous panel on Aug. 29.

Miscellaneous panel members are: David L. Cole and Nathan P. Feinsinger, chairman and vice-chairman, respectively, and representing the public; John Despol and Stephen Levitsky, labor members; J. C. Goldrich, Emmons Products Co., and Homer D. Sayre, commissioner of the National Metals Trades Commission.

WLB Places Responsibility

Fort Wayne, Ind.

• • • Decision of the Sixth Regional War Labor Board affecting 3500 workers at the International Harvester Co. plant here, represented by United Automobile Workers, local 57, CIO, places responsibility on the company to have work ready when the workers want it.

Martin Swings into Production Of JRM Mars Super Navy Planes

Baltimore, Md.

• • • **Sixty-nine manufacturers** in 37 cities spread out over 12 states were today busily turning out subassemblies for the JRM Mars, and several more were to be added in the near future as production of 20 of these 72½ ton Navy transports got into full swing at the Baltimore plants of The Glenn L. Martin Company.

Sub-contracted items for these super flying boats, sisterships of the famous Mars which is now ranging over the Pacific for the Naval Air Transport Service, run all the way from wing tips, flaps, control surfaces, floats, beaching gear, exhaust stacks and interior equipment to ladders, stairs, bolts, hinges, fitting and a wide assortment of small machined parts and assemblies. Seats for pilot, co-pilot, radio operator and flight engineer, tables for the navigator and radio operator, prop de-icer tanks and water tanks for the aft toilets, cowl flap operating drives and control columns are likewise included in the vast program which includes three well known aircraft companies—Spartan, Bellanca, and Kellett—in addition to the Mars' actual designer and builder.

Largest of all the sub-contracts is held by the Spartan Aircraft Company of Tulsa, Okla., only sub-contractor located west of the Mississippi, which is building wing-tips, ailerons, stabilizers, elevators, fins, rudders, flaps, and tabs for the giant passenger and cargo transports.

Far across the country in Newcastle, Del., the Bellanca Aircraft Corp. has mobilized its facilities to turn out wing floats and float struts, while up in Bridgeton, N. J., the Ferracute Machine Company is turning its energies to the massive beaching gear on which the big boats will rest between flights.

Exhaust stacks for the JRM's powerful engines are coming off the production line of the National Radiator Company, Johnstown, Penna. The Warren MacArthur Corp. of New York is supplying seats for the pilots and other crew members, while tables for the navigator and radio operator are in the works respectively at the Essington Metal Works, Essington, Penna., and Castaloy Corp. of Detroit. Control columns and quadrants are being assembled at Ritter Company, Inc., Rochester, N. Y.; ladders and stairways at Kellett Aircraft Company, Philadelphia, and Charles T. Brandt, Inc., Baltimore. And down in Murfreesboro, Tenn., Air Utilities, Inc., sole non-Maryland representative from south of the Mason-Dixon Line, is fashioning crews' lockers for the "flying Liberty ships."

Machine shops predominate among the sub-contractors what with bolts, spar splices and fittings for hull, center wing and almost every other part of the airplane predominating among the sub-contracts; but there are companies on the list whose peacetime output is far removed from aircraft production as evidenced by their names. The All Purpose Gold Corp. of Brooklyn, N. Y., for example, is building bell crank housings, while the Diecraft Engraving Company of Baltimore is making spar splice and rib assembly fittings. And then there are the General Oilburner Company, Baltimore; Marco Chemicals, Inc., Sewaren, N. J.; National Advertising Company, Westminster, Md.; Post-O-Graf Company, Trucksville, Penna., and the Allen Stoker Co., Allentown.

Sixteen of the 69 sub-contractors are Baltimore neighbors of the Martin Company, with Philadelphia holding down second place with 11, and New York City third with 5 or 6 if the one Brooklyn representative is included in its total.

THE NEW MARS: *A single rudder tail more than 40 ft. high features the production version of the Martin Mars, world's largest flying boat. Twenty of these 72½-ton giants are now being built by the Glenn L. Martin Co. for the Navy.*

New Broom To Sweep Clean

Washington

• • • **Acting WPB Chairman J. A. Krug told the Mead Senate War Investigating Committee on Aug. 28 that he would carry out the Nelson reconversion plans, see that production lags in munitions are overcome, streamline WPB and get rid of unnecessary controls. Mr. Krug also told the committee that he would fire anybody guilty of feuding.**

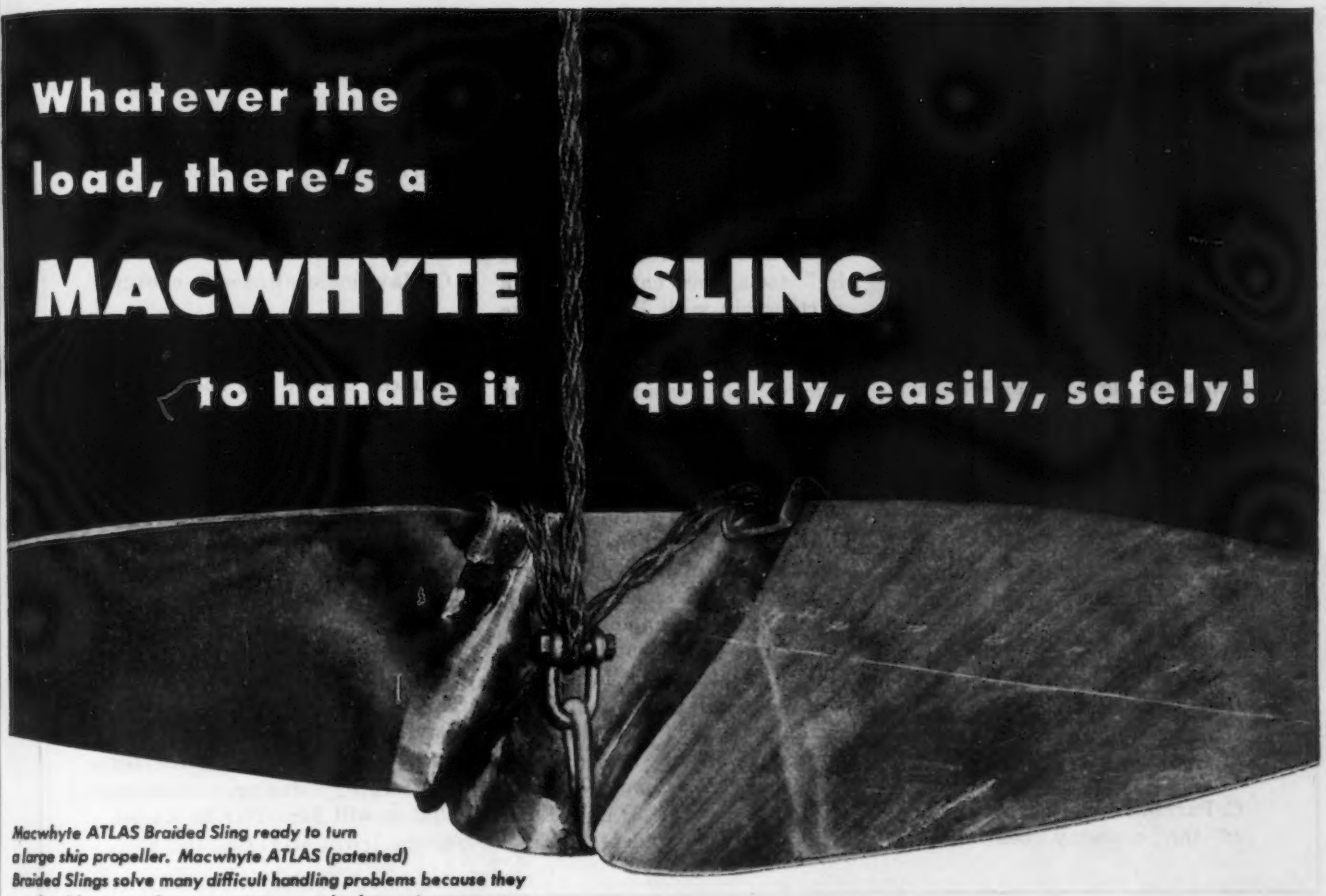
WPB Amends Direction 15

Washington

• • • **WPB has amended** Direction 15 to CMP Regulation 5, so as to permit any person assigned a maintenance, repair and operating supplies symbol (MRO) and rating under the regulation to obtain materials to install or relocate machinery or equipment.

Where construction is involved, officials said, persons may obtain materials needed for the installation or relocation of machinery or equipment that Direction 2 to L-41 (construction) permits them to install or relocate without obtaining WPB authorization. If construction is not involved, materials valued up to $500 may be obtained to install any piece of machinery or equipment rated or authorized by WPB.

Whatever the load, there's a MACWHYTE SLING to handle it quickly, easily, safely!



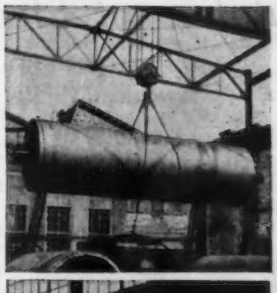
Macwhyte ATLAS Braided Sling ready to turn a large ship propeller. Macwhyte ATLAS (patented) Braided Slings solve many difficult handling problems because they are flexible as manila rope, yet strong and safe as wire rope.

Whether you're lifting 1,000 pounds or 500,000 pounds, there is a size and type of Macwhyte Sling to meet your requirements. If one of our standard slings will not do the job effectively, Macwhyte engineers will design a special sling to exactly fit your requirements.

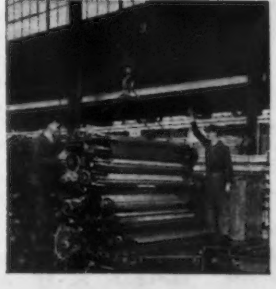
Whatever your sling problem, get in touch with Macwhyte. You'll receive prompt, practical cooperation and suggestions based on experience with hundreds of others doing jobs like yours.

Thousands of Macwhyte slings are serving our armed forces and essential industries. We make this pledge to you: "We will continually produce to the utmost of our ability without sacrifice of quality. We will study your handling needs with you and help you plan the design on which the best delivery can be made."

★ *Don't stop now—buy MORE War Bonds!* ★



Here are two type one ATLAS Braided Slings handling a Paper Drying Roll. These slings are lightweight, easy to use, but have tremendous strength because they're made from endless wire ropes —no splices to break. As one user has said, "They handle like a silken rope."



Here is a set of Macwhyte ATLAS Braided Slings lifting Color Inker for a Magazine Press. There is a size and type for your needs made in any length, whether you need a two-foot or a two-hundred-foot length.

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When larger cranes are built, Macwhyte ATLAS Braided Wire Rope Slings will be made to meet their capacity

Industrial Briefs . . .

• REPRESENTATIVE APPOINTED—Sterling Alloys, Inc., Woburn, Mass., announces the appointment of W. G. Merowit, 436 Niagara Street, Buffalo, as its engineering service representative for the western part of New York state.

• NEW DIVISION FORMED—Wall-Colmonoy Corp., Detroit, manufacturers of hard-facing alloys and overlay metals, announces the formation of the Machine Tool Welding Division, located at 19351 John Street, Detroit 3. The new division will handle all the corporation's custom and contract welding.

• PARTNERSHIP FORMED — Earl C. Parkhurst, former sole owner of the company bearing his name and manufacturing "Parlec" tools, has entered into a partnership with P. W. Breene and hereafter will operate under the name Universal Tool Co. The plant is located at 919 East Redondo Boulevard, Inglewood, Cal.

• NEW WEST COAST OFFICE—Rheem Research Products, Inc., Baltimore, announces the acquisition of a West Coast research and manufacturing branch, and the appointment of three new distributors. The West Coast plant is located at 714 West Olympic Boulevard, Los Angeles 15. The distributors are: MacDermid, Inc., Waterbury 88, Conn.; Wagner Brothers, Detroit 2, and J. C. Miller, Grand Rapids 4, Mich.

• OFFICE REMOVED — John S. Barnes Corp. has moved its Eastern sales office to Room 660, Industrial Office Building, 1060 Broad Street, Newark 2, N. J. E. C. Hawkins continues in charge.

• PLANT IMPROVEMENTS—Buffalo Bolt Co., Buffalo, announces that it has spent more than $1,000,000 in permanent improvements to its plant in North Tonawanda, N. Y., during the last four years. Improvements include a new heat-treat installation, new galvanizing and plating facilities, additional bar-pickling equipment, and replacement of bolt and nut making machinery.

• OLD FIRM, NEW NAME—H. G. Irwin Lumber Co., makers of rock maple hammer boards for the forging industry, announces that it will hereafter be known as the Irwin Mfg. Co., Inc.

Insulation of Steel Plant Equipment

(CONTINUED FROM PAGE 52)

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** In referring to the first part of this article which appeared last week, the printed matter on pages 46 and 47 should should proceed that on pages 44 and 45.*

IN ROLLS

Craftsmanship Means Greater Tonnage
Longer Roll Life—Lower Roll Costs

Utmost manufacturing precision and attention to small details is as important in roll production as it is in the manufacture of a fine watch. The same careful attention must be given to every step in the manufacturing process—to produce rolls with longer life—at lower cost.

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WITH BEAM BLANKS
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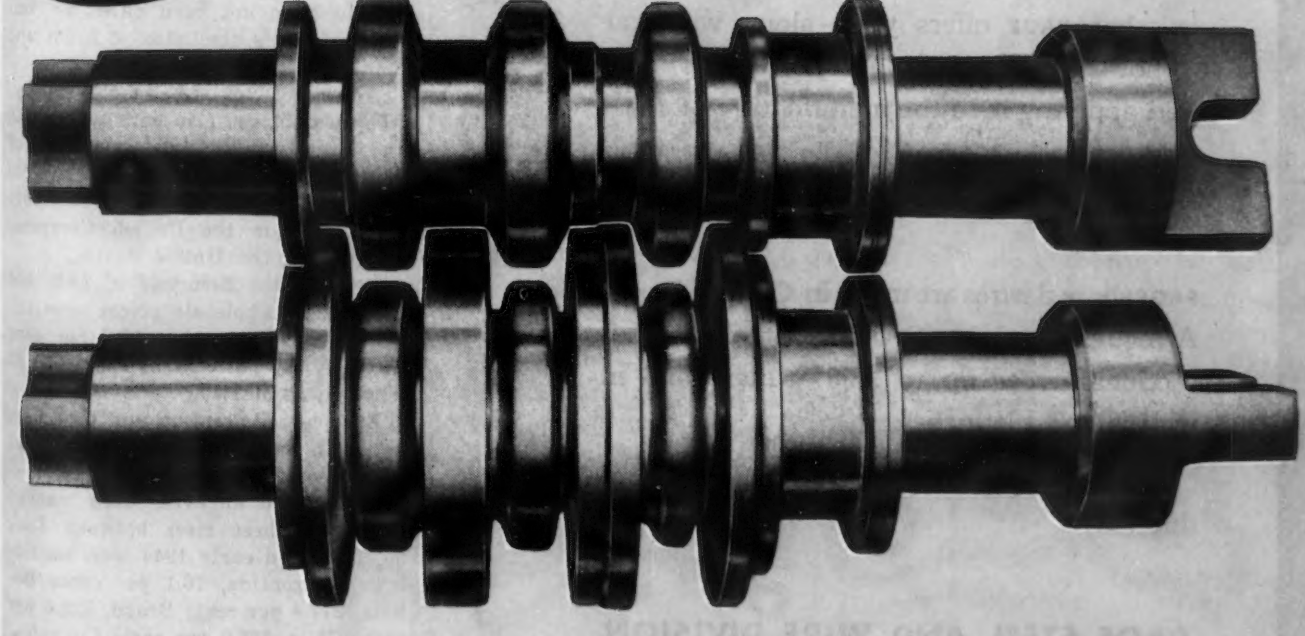

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What isn't always so obvious is just *how* you can eliminate costly operations by the use of shaped wire. And that's where **PAGE** comes into the picture.

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BRIDGEPORT • CONNECTICUT

Postwar Purchasing Power Being Built In Latin America Nations

New York

• • • **Booming wartime exports to belligerent powers, almost wholly to the United Nations, together with restricted imports of merchandise, have already given the 20 nations of Latin America more than $1¼ billion worth of foreign purchasing power, according to a study of the area's wartime trade and economic condition prepared by the National Industrial Conference Board.**

In 1943 alone, Latin America's trade balance with the world was close to $1,090,000,000 on the export side, as against an export surplus of $338,200,000 in 1938, the last full peacetime year. The marked reversal in the trade balance with the United States is indicated by the change from an import surplus of $27,600,000 in 1938 to a "cash" export surplus of $583,900,000 in 1943. Lend-lease imports from the United States, consisting entirely of military goods, are excluded from the latter balance.

By the end of 1941, the study finds that Latin America had accumulated a total of $891,000,000 in purchasing power as a result of wartime trade with the United States alone.

Since these greatly increased sales abroad have not been offset by imports of goods, the influx of funds and credit has resulted in inflation.

According to the board's study, "The wartime rise in both prices and the note issue in most countries of Latin America has been definitely less than in Axis Europe, but appreciably more than in the British Commonwealth and the United States."

Between the first half of 1939 and early 1944, wholesale prices rose 100 per cent in Argentina, 95.7 per cent in Chile, 110 per cent in Peru, and 83 per cent in Mexico.

Except in Argentina and Uruguay, notes in circulation — the principal measure of wartime inflationary pressure—showed an even more marked increase. These rises between June 30, 1939, and early 1944 were as follows: Argentina, 76.1 per cent; Bolivia, 277.4 per cent; Brazil, 133.6 per cent; Chile, 166.9 per cent; Colombia, 124.7 per cent; Ecuador, 257.7 per cent; Peru, 209.8 per cent; Uruguay, 42.9 per cent; Venezuela, 111.3 per cent (from Dec. 31, 1939); Costa Rica, 196.0 per cent; Cuba, 190.7 per cent; Haiti, 191.3 per cent; Mexico, 269.9 per cent; and El Salvador, 186.7 per cent.

Outstanding

Here is a portrait of one of the country's foremost Shepherds—an outstanding example of championship quality. In recent years light alloys have come to the front so rapidly that they too are judged by many manufacturers as outstanding for many many uses. The Bohn organization is one of the leading sources for both the engineering and fabrication of aluminum, magnesium and brass alloys. Remember the name Bohn. In the postwar period we can undoubtedly be of real service to your engineering and production departments.

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Western Representative: F. Somers Peterson, 57 California St., San Francisco, Calif.

Foreign Labor For Foundries

Cleveland

• • • **Failure of the recruitment programs here to produce sufficient manpower for the foundry industry, particularly that section devoted to the manufacture of heavy truck program castings has led to formation of a plan to import upwards of 300 natives of the Barbadoes Islands (British). Similar plans are reported to be even further advanced in the state of Michigan.**

It is being planned that special representatives of a group of employers will go to the islands, southeast of Puerto Rico, and recruit a full boatload which will be approximately 900 men. These will be distributed among the essential certified foundries of the several states involved. Housing facilities present a major problem at present.

Official sources indicate only minor rises in the cost of living in Argentina and Uruguay since the first half of 1939, but show the following increases elsewhere: Bolivia, 213 per cent; Brazil, 28 per cent; Chile, 97.6 per cent; Colombia, 37.1 per cent; Peru, 57 per cent; Costa Rica, 61 per cent; Cuba, 70 per cent, and Mexico, 88 per cent.

Significance is attached by the study to the fact that "in nearly every country of Latin America the rise in demand deposits during the war years has been greater, both absolutely and percentagewise, than the note issue.

"This suggests, in view of the relatively restricted ownership of such deposits, that the increased funds and purchasing power from the wartime export expansion have not been widely distributed within each country—a situation that appears to have contributed to the current wave of social unrest throughout much of Latin America."

The Conference Board's study concludes that Latin America's inflation problem differs from that of the belligerent countries since it has a temporary basis.

"The blocked foreign balances which are largely responsible for the inflation are due primarily to the inability to import goods. Such goods will of course become available again once the war is ended, and the blocked balances will thus presumably be liquidated almost automatically, and with them much of the inflation itself."

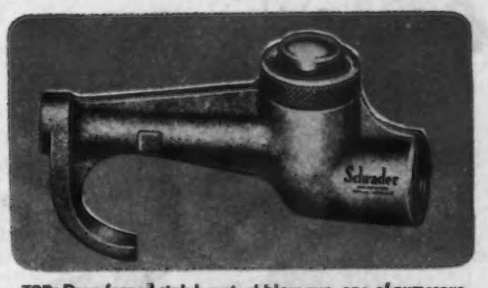
though he's not a carrier pigeon, there's a message "up his sleeve"

You are looking at a bird who knows how to go places and do things with natural air.

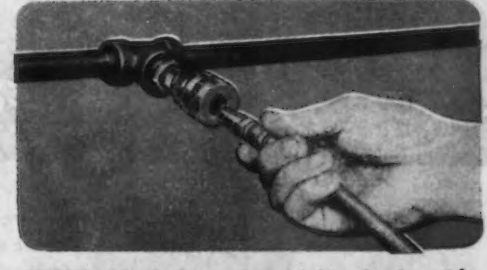
You, too, can do many things with air... compressed air. And you can do them cheaply, quickly, safely, and effectively if that air is properly controlled.

Years ago, Schrader dispelled the old bugaboo of air losses, substituting controlled, intermittent blasts for wasteful constant flow. Since then Schrader has developed hundreds of devices for the control and use of air. So saving are these devices that you can often multiply your jobs for air *without* adding to your compressor capacity.

Two of the many Schrader contributions to air power are Blow Guns and Air Couplers. All Schrader blow guns and air couplers shut off automatically and instantly when released, conserving high pressure air. For all the advantages of Schrader blow guns and air couplers, write in for Bulletin A-12I.



TOP: Drop forged stainless steel blow gun, one of numerous Schrader types. Drop-tested from 11-story building for ruggedness. 8 different interchangeable noses available.



BOTTOM: Schrader Heavy Duty Air Line Coupler, quick acting, air tight, automatic shut-off.

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This three-color folder tells you all about Turner's new Plast-O-Lock (pat. applied for) collet type gauge. This gauge is another first by the Turner Brothers in bringing to industry an improved type of standard plug gauge that will save you time and money in your inspection department.

WRITE TODAY
FOR YOUR DESCRIPTIVE FOLDER

THE NEW TURNER
PLAST-O-LOCK GAUGE

Improved Magnesium Alloys and Technique Expand Postwar Field

Pittsburgh

• • • **Marked improvements have** been made in recent years in the mechanical properties of the magnesium alloys. Sand castings can be produced with excellent strength and uniformity. Alloys have been developed that can be extruded faster and with higher mechanical properties. New methods have been developed for commercially forming magnesium sheet, and a great deal of work is under way to improve forging practices.

Magnesium alloys with superior resistance to corrosion and improved methods of surface protection have been developed. Resistance to corrosion is greatly improved by reducing impurities such as iron and nickel. Iron (in quantities greater than 0.005 per cent) impairs resistance to corrosion. But small amounts of manganese have been shown to improve resistance to corrosion. Moreover a number of chemical treatments have been developed which greatly improve resistance to corrosion when used as the base for paint coatings.

New and improved welding techniques have been developed. Magnesium alloys are readily joined by torch welding which develops weld strengths of 60 to 90 per cent of the parent metal. And welds of certain alloys can be strengthened by hammering. Spotwelding is practicable because of the relatively low electrical conductivity of magnesium and its alloys. The electric Heliarc welding process does not require the use of salt fluxes. Prior to the development of this process, it was necessary to clean welds scrupulously since residual flux was a source of corrosion. Because welding flux is not required, the Heliarc process may also be used for lap, fillet, and edge welding.

Improved remelting fluxes have been developed to minimize the loss of magnesium by oxidation. The use of these fluxes reduces casting costs.

The aviation industry has always been the greatest single user of magnesium. Before the war, 90 per cent of the magnesium produced in this country went into aircraft in one form or another. Some aircraft designers believe that the metal can be substituted for aluminum in aircraft wing construction. A thicker, welded magnesium alloy skin with a smooth flush surface should reduce drag caused by a riveted aluminum skin. Magnesium

Here's a great small spotwelder that is

★ *sturdy...*

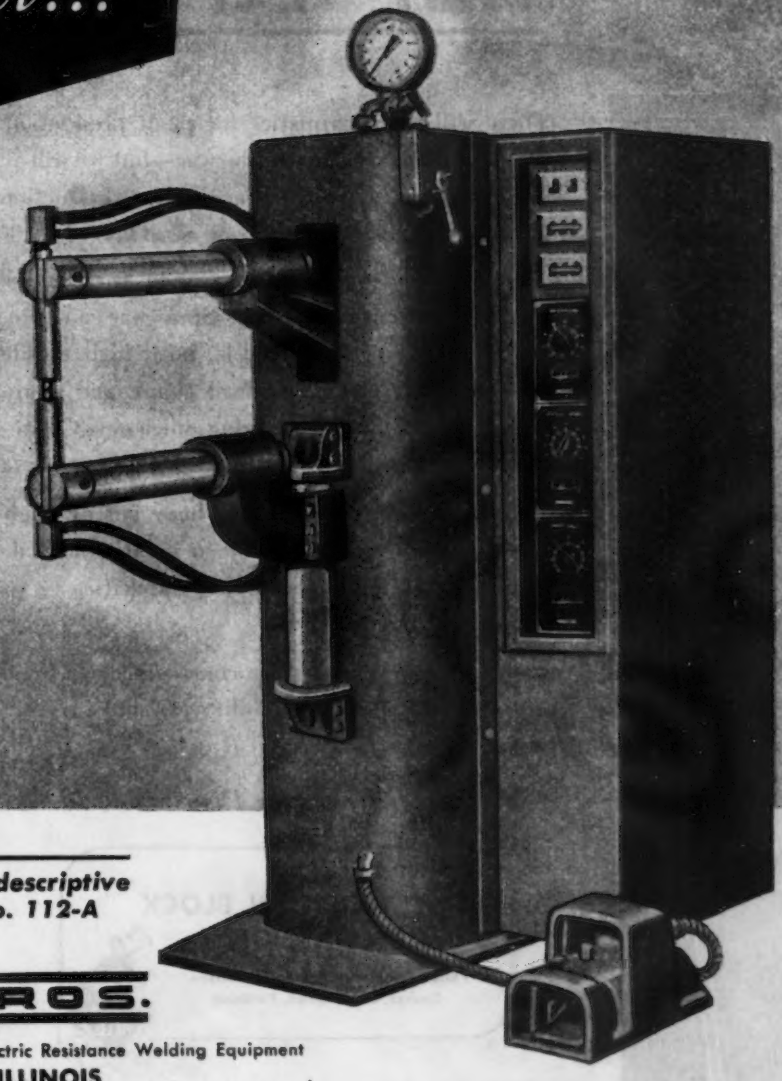
★ *precise...*

★ *fast...*

★ *compact...*

SCIAKY engineering has proved that it is possible to make a machine that is small, yet capable of delivering fast, high quality spot welds in day in and out production. Incorporated in this rocker arm type welder are exclusive features hitherto only used in larger machines. The use of heavy duty roller bearings at the fulcrum point of the arm, together with a special rubber cushion in the pressure cylinder, assure smooth action . . . eliminate hammering and wear. The design is compact with controls and contactor in a hinged cabinet . . . dials are convenient to operator and unit may be easily installed or moved.

If your problem involves the fabrication of mild, stainless or zinc-coated steels and brass in light gauges, it will pay you to consider the "PMCR.0-1."



MODEL PMCR.0-1

Rated 30 KVA at 50% duty cycle for power supply of 440 or 220 volts, 60, 50 or 25 cycles. Capacity: clean mild steel from two thicknesses of .016" up to and including .080"—stainless steel up to a maximum of .040" plus .040". Speed on two thicknesses of .032" thick pickled mild steel is 180 welds per minute. Maximum electrode pressure at 24" throat depth is 1000 lbs.

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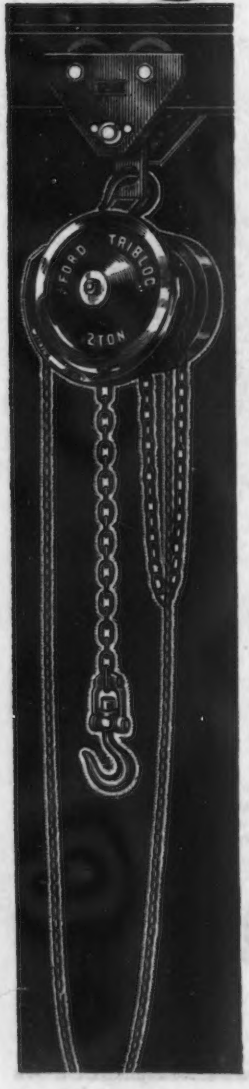

There will be no armistice for plant production. We are all hurrying to win the war—but we will all have to hurry to win the peace. Plant production will be as important tomorrow as today.

When fast delivery counts—**FORD TRIBLOCS** are ideal for constant hard usage. Spur gear construction, ball-bearing load wheels, both high tensile strength and elasticity in load chain, and many other features assure enduring efficiency. Capacities: ¼ to 40 tons.

FORD SCREW HOISTS are used where **TRIBLOC** high speed and efficiency are not so greatly needed. Light weight; highly portable. Capacities ½ to 10 tons.

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BRIDGEPORT · CONNECTICUT

Workers Shifted

Cleveland

• • • The War Manpower Commission here made known last week that large numbers of skilled workers are being shifted from state to state to fill urgently needed jobs on "secret" Army and Navy work.

Although a Class I acute labor shortage area, Cleveland which is the most important center of Region V, has contributed about 3000 skilled workers to such out of state projects. The location and nature of the projects remain a secret but the men are gone despite the desperate need for men here.

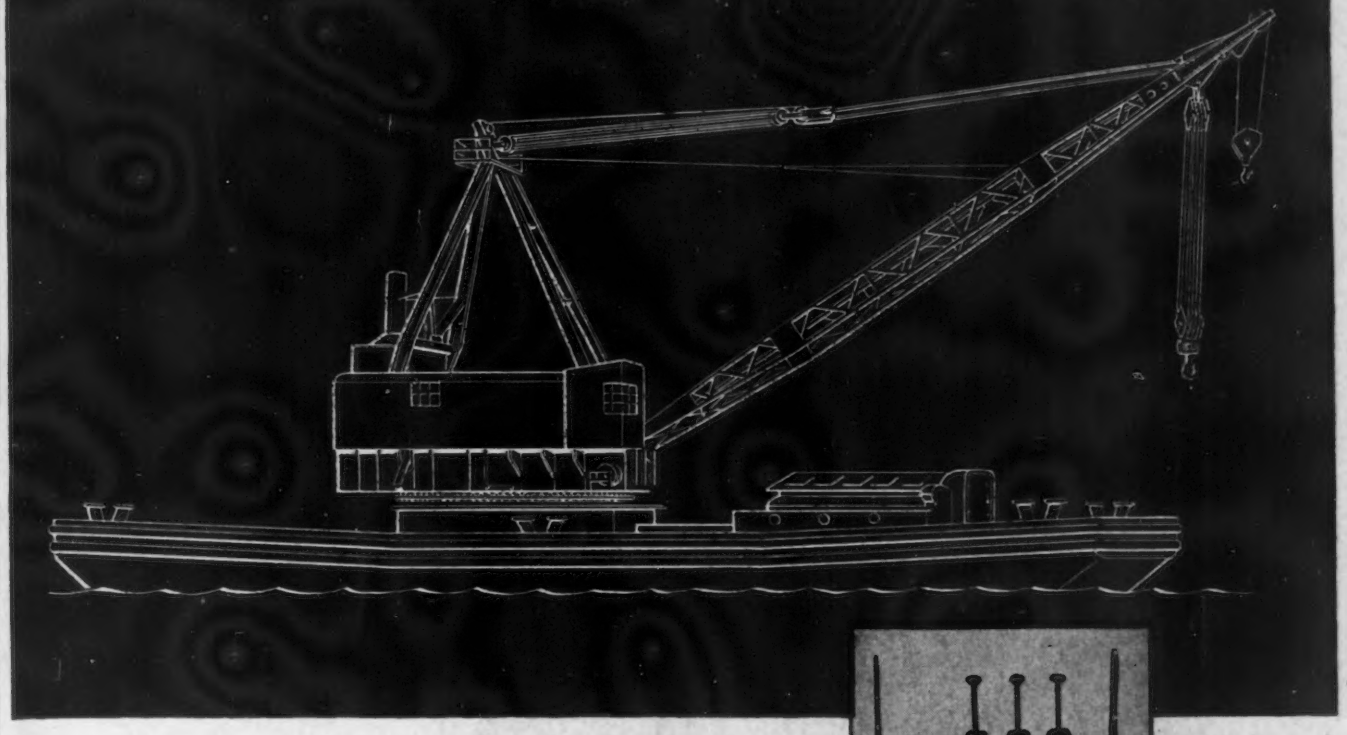
Opposing the thought that it is a one way movement of men, it was also revealed by this agency that approximately 10,000 men have been brought into the state during the last six months to assist the forge and foundry manpower shortage. No estimate of how many had accepted or stayed on such employment was immediately available.

alloys are used in practically all aircraft engines as crankcases, manifolds, rocker box covers, oil sumps, supercharger housings, and valve covers. Carburetors, magnetos, automatic pilots, and engine starters use magnesium alloy castings. Fuselage parts include landing and tail wheels, instrument panels, pedals, levers, oil tanks, door hinges, landing gear, quadrants, pulleys, seats, tables, wing fillers, partitions, floor beams, doors, and ventilating ducts.

The use of lightweight metals in the postwar passenger automobile is being discussed everywhere. However, the prospect of using a considerable amount of magnesium for structural purposes is rather small. Initial cost to the auto buyer is important. He is unwilling to pay the additional cost for long range economy of operation that could be expected from lightweight structural parts. Nevertheless, magnesium alloys can be used to advantage in some engine parts.

In buses and trucks, first cost is not so important. A pound of payload can generally be added for every pound of dead weight saved. If payload does not replace dead weight, less power is needed for stops and starts and these are savings on tires and gasoline. Magnesium alloys should be advantageous for many structural parts above the floor line. If used below the floor line or in closed spaces

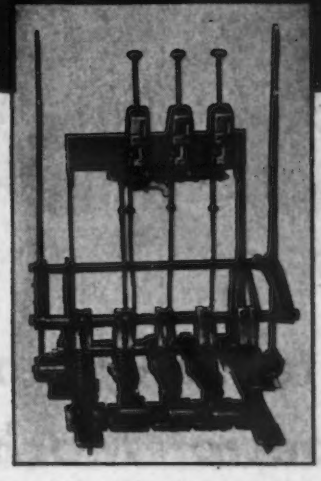
GIVE W. A. B. CONTROLS A PLACE IN YOUR PLANNING



Boats that slug it out ...

or sweat it out ... both use

W·A·B Controls



Hard hitting, fast running fighting craft that slug it out toe to toe with the enemy and unglamorous work boats like this Army floating derrick, don't have a lot in common. But they are alike in one important respect—the need for responsive, dependable controls. W-A-B Controls are serving on both types of vessels.

On a number of different fighting ships, W-A-B Controls govern the entire cycle of engine maneuvering: speed regulation, clutching and declutching, application of shaft brakes, reversing of the engines, and synchronization or load balancing. The whole series is carried out merely by moving small handles through a small arc. On work boats, many of the operations involved in manipulating boom and hoist are handled in the same manner, and with the same ease and certainty.

Applications like this give a preview of the possibilities of W-A-B Controls for post-war use . . . and may suggest places where you can profitably apply the devices in improving your products, or stepping-up your production. When you are planning for the future, be sure to give consideration to the controls of the future.

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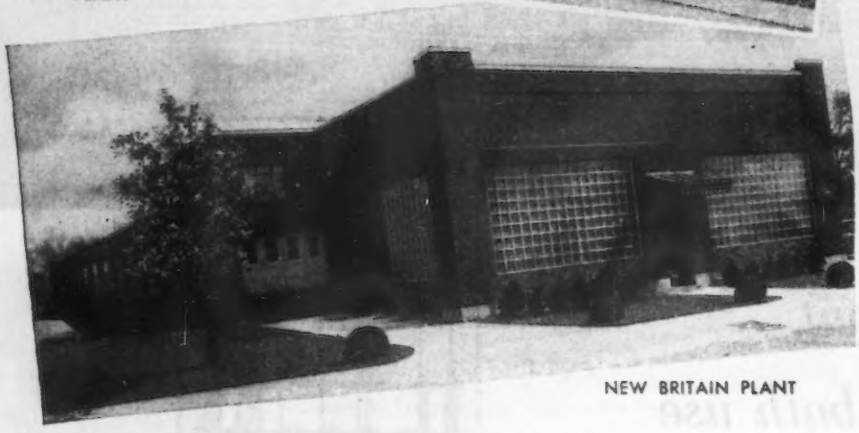

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Fenn Plants, wholly engaged in war production today, will, when peace comes, continue building special machinery, in which they have majored for three generations. If you are thinking of building new machines or remodeling old ones, it's time to plan Now. Fenn designers and engineers have solved many knotty problems in machine design, resulting in efficient, profitable production. Fenn has the men and experience to handle almost any machine design job. Consultation is invited and involves no obligation.

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Fenn Plants are delivering precision parts and sub-assemblies for planes, artillery and other vital war equipment to practically every industrial center.

THE FENN MANUFACTURING CO.

HARTFORD, CONNECTICUT

where water can accumulate, magnesium may corrode unless given adequate protection. Magnesium alloys can also be used for the frames of mechanically operated doors, opening mechanisms, seat parts, ceiling braces, window guard rails, tire carriers, and frame castings. The metal should also be used for such engine parts as crankcases, transmission cases and covers, oil pans, and the like.

In reciprocating machinery, light weight lowers operating costs, reduces vibration, and permits higher operating speeds. Magnesium has been used to some extent in textile machinery. For the knife frames on bread slicing equipment, the use of magnesium permitted a reduction of the weight of one particular unit from 44 to 13 lb. with corresponding reduction in bearing loads and vibration. Similar advantages may be obtained for equipment for shoe making, paper folding, cigarette making, can making, book binding, printing, and any types of office machines.

Equipment Requiring Portability

Portable equipment, any article that must be lifted or moved about, becomes a potential application for magnesium. Foundry equipment is a good example. Magnesium alloy pattern plates, foundry flasks and core boxes were just reaching general acceptance when war uses took over. A magnesium core box or pattern plate is light and easy to handle. By reducing the weight of a core box from 15 to 10 lb. through the use of magnesium, a man was able to increase his output of cores from 100 to 120 in a single working day. Moreover, plates are easy to shave down and the metal satisfactorily resists the wearing action of sand.

Typewriters, pneumatic tools, sewing machines, binocular bodies, goggle frames, luggage, kettle drum and snare drum frames, dock boards, X-ray equipment, vacuum sweepers, welding equipment, and unloading conveyors are additional items of portable equipment which employed the light weight of magnesium alloys before the war.

Chemical Applications

Although most acids quickly attack magnesium, hydrofluoric and chromic acids have little or no effect on the metal. It is also highly resistant to solutions of alkalies, borates, fluorides and chromates. Cylinders for solidifying caustic soda, and hydrofluoric apparatus made of magnesium have proved satisfactory. Magnesium pow-

From PSF Foundry Sand . . .

TO THE SANDS OF *The Seven Seas!*

Anchors of all sizes (those illustrated are 6000-pounders) have been one of our war assignments. Big ones or little ones, we know they'll hold, because they have the advantageous grain structure, sound texture, dependable strength and faithfulness to specification that you can always count on in PSF castings. Technique, equipment, experience—they're the reasons why.

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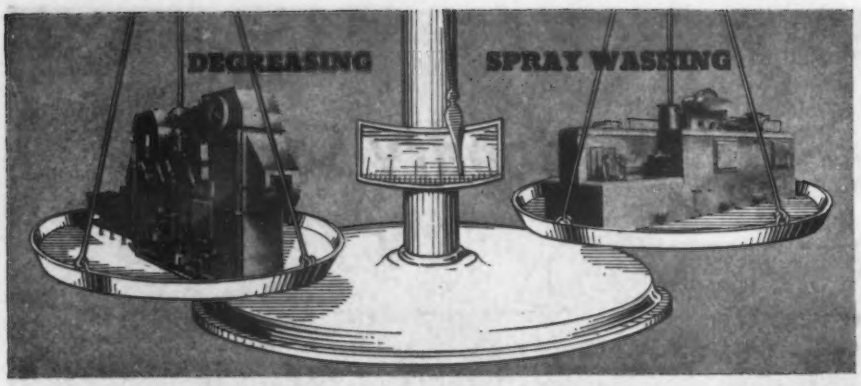

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Detrex is the one manufacturing source where you can go for unbiased and authoritative opinions on the relative merits of various types of metal cleaning machines and chemicals. For, not only does Detrex produce degreasers, washers and processing machines, but also supplies Perm-A-Clor and Triad degreasing solvents, and Triad Alkali Cleaning Compounds for washers, electric cleaning and soak tanks. Each has its application, and your specific requirements are our guide.

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der is used in the hydrogenation of oils, and magnesium shavings are used in the drying of oils and for the purification of certain gases. The affinity of magnesium for oxygen and nitrogen makes it an excellent deoxidizer and scavenger in non-ferrous foundry metallurgy. Addition of the pure metal helps to remove bismuth from lead and to cleanse tin-lead solder, brass, bronze, copper, nickel, nickel-silver, and Monel. Magnesium is also employed as a catalytic agent in the formation of complex organic chemical compounds.

In prewar days magnesium was used for plates for rectifiers, circuit breaker parts, discs for registering meters, fuse wire, degasifiers in radio tubes, radio transmitting and receiving cases, screw machine parts, housing for street car motors, wire enameling pulleys, fans for electrical motors, and as a low electrical conductivity alloy for the rotors of high torque motors.

AWS Publishes Tests For Alternate Aircraft Steels

New York

• • • **Increase in aircraft** production has necessitated the use of steels hitherto not used or little used by the aircraft industry. This in turn has created the problem of the weldability of these steels. To meet this problem the American Welding Society has recently published "Weldability Standards for Alternate Aircraft Steels" which sets forth a series of tests enabling the comparison of proposed alternate steels with standard aircraft steels.

The standards are based on a research investigation of the problem covering both arc and gas welding, and the prescribed tests have been selected not only for their reliability but also for their ease of performance in the usual aircraft plant.

Included are the T-bend test; transverse butt-joint tension test of ¼-in. plate; transverse butt-joint tension test of ⅛-in. sheet; transverse butt-joint tension test of tubing; and welded double-tube triangle test. Test specifications include test plate dimensions, filler metal sizes, preheating and welding procedure as well as the methods of testing.

Copies of the standard are available in the form of a 6 x 9-in. bulletin from the American Welding Society, 33 West 39th Street, New York 18, at a price of 25c. per copy.

1947 WHATEVER THE DATE

Welding facilities will provide for the production of welded steel structures beyond the scope of most weld shops in size and precision—after the war.

Machine tool facilities will exceed in size and capacity the usual equipment found in the larger tool rooms —after the war.

We will be glad to get in touch with you or your representatives as to the nature and scope of these facilities—at any time.

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HIGH TIME THAT YOU "DISCOVER" STRENES METAL

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Builders of automobiles, trucks, tractors, farm implements; refrigerator, stove, metal furniture manufacturers; designers of fans, blowers, bicycles; almost anything involving drawing and forming operations.

They are able to have Strenes Metal cast to shape — usually to 1/16", saving 50% to 75% of the time ordinarily required to machine off excessive stock. They are obliged to redress their dies about 1/3 as frequently as usual. Runs of 1,000,000 deep drawn parts are not unusual.

That is just part of the Strenes story. Why not get the rest of it? Isn't it high time you also "discover" Strenes Metal for drawing and forming dies?

THE ADVANCE FOUNDRY CO.,
100 Seminary Ave.,
Dayton 3, Ohio

Strenes METAL

SAE and AISI Prepare New Specifications For Some Alloy Steel

New York

• • • Tentative uniform method of specifying alloy steels by hardenability to expedite wartime manufacture of weapons and armament and to conserve critical materials by facilitating selection and processing of steels on the basis of physical characteristics rather than chemical composition has been developed jointly by the Society of Automotive Engineers and the American Iron and Steel Institute.

The hardenability data are presented in a booklet, "Tentative Hardenability Bands," prepared cooperatively by the Iron and Steel Division, SAE Standards Committee; Iron and Steel Committee, SAE War Engineering Board, and Technical Committee on Alloy Steels, AISI.

The uniform method currently is applicable only to 37 standard fine-grain steels of modified chemistries for which tentative hardenability bands have been published. The steels, identified by customary SAE and AISI numbers, plus the code letter "H," include 4100H from 0.30 to 0.50 carbon inclusive; 4340H; 4620H; and the 8600H and 8700H series from 0.20 to 0.50 carbon inclusive.

For other standard steels minimum hardenability requirements consistent with minimum chemical compositions are being prepared. These will apply until sufficient SAE standard end-quench hardenability test data for full bands become available from studies now under way.

The new method, characterized as epochal and destined to become widely used by design engineers and in metal-working industries, springs from an engineering philosophy of selecting steels on the basis of hardenability as an index of tensile strength, with only corollary reference to chemical compositions, enunciated at SAE meetings for some years. The SAE Iron and Steel Division developed a "Recommended Practice on Method of Determining Hardenability," which was published in the SAE 1942 Handbook.

Then the SAE War Engineering Board Iron and Steel Committee undertook cooperatively with AISI to collect and to analyze test data so as to establish hardenability bands for NE and other wartime steels in larger demand.

Stearns MAGNETIC EQUIPMENT for BETTER LOWER COST INCREASED PRODUCTION

Magnetic Pulleys—Extensively used in all industries for protection against tramp iron damage to expensive machinery; guarding against costly and embarrassing shut-downs; helping to avoid injuries and saving lives of workers; an aid to guarantee purity of your product, whether for food, coal, chemicals or whatever; reclaiming metals and many other uses.

In all practicable sizes to fit conveying systems or in self-contained separator units with tail pulley, belt, sturdy frame, with or without casters. (Bulletin 302.)

Magnetic Drums—Have wide use where pulleys may not be advisable by reason of space restrictions, conveying set-up, etc., for instance, in reconditioning hot foundry sand to save belts; in paper making operation ahead of hogs while conveying trimmings, leeching of ore for mining operation; tramp iron removal from flow in feed and grain mill processing, to cite only a few.

Also designed in dust-tight housings for insertion into pipes and chutes for breweries, grain mills, carbon black factories and other places where purity of product and clean atmospheric conditions are necessary. (Bulletin 93.)

Magnetic Filters—For ceramic and pottery fields where pure, iron-free liquids like ground and cover coat, slip, liquid enamel are a "must"; freeing cutting oils, inks and numerous liquid products from contamination by iron and steel particles. (Bulletin 120.)

Spout Magnets—In flow of material to take out tramp iron, entirely automatic, easily cleaned by conveniently located switch control, always in working position when machinery is operating. (Bulletins 92 and 97, larger sizes.)

Many Other Types—Multiple zoned magnetic separators of gravity or deflector design for treating highly reluctant material and for difficult separations; (Bulletin 701); Stearns Wetherill or cross belt for exacting concentration where more than one ore or mineral is involved; ring typed, wet type and others. (Bulletin 81.)

Laboratory Service—Outstanding laboratory facilities available for testing your material to be used for your own analysis and with recommendations as to most efficient and profitable magnetic treatment. (Bulletin 800.)

For Magnetic Equipment Consult Stearns Magnetic, Milwaukee 4.

IF IT'S MAGNETIC WE MAKE IT
PULLEYS · BRAKES
DRUMS · CLUTCHES
SEPARATORS · FILTERS
ORE CONCENTRATORS
SEPARATION OR LIFTING MAGNETS
Stearns MAGNETIC MANUFACTURING CO.

635 So. 28th St. MILWAUKEE 4, WIS.

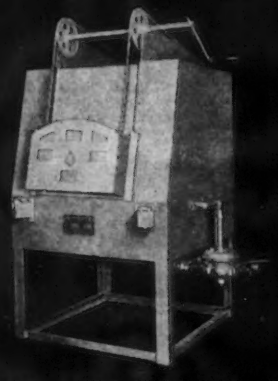
STEWART

THE BEST INDUSTRIAL FURNACES MADE

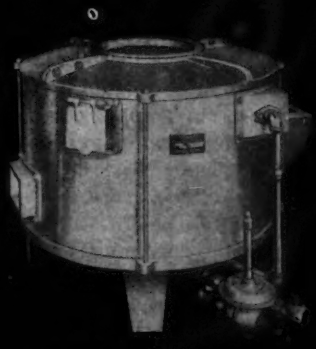
A TYPE FOR EVERY NEED

In addition to large units designed to meet specific production requirements, STEWART also builds these famous

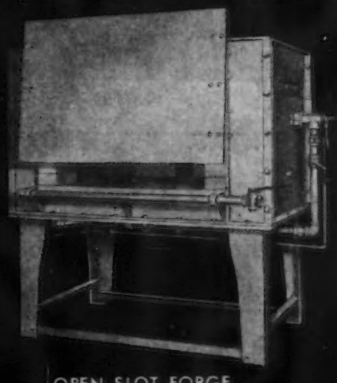
STANDARD INDUSTRIAL FURNACES



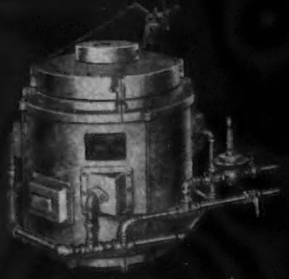
SEMI-MUFFLE OVEN FURNACE



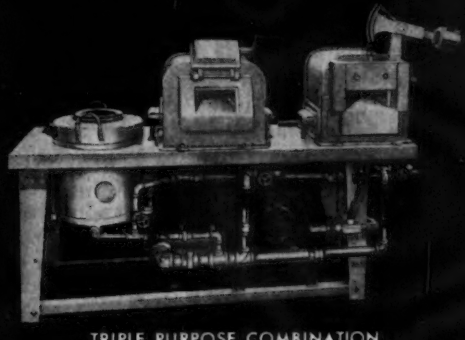
ROUND POT FURNACE



OPEN SLOT FORGE

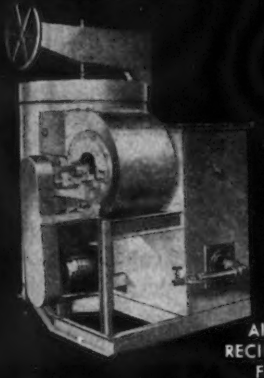


STATIONARY METAL MELTING FURNACE

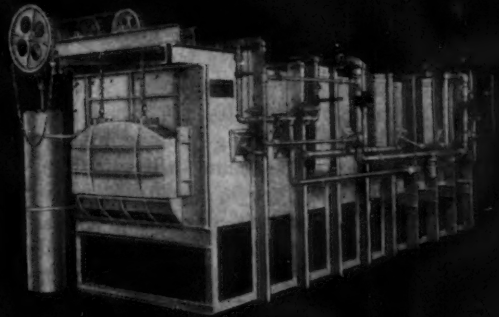


TRIPLE PURPOSE COMBINATION

SMALL FORGE



AIR DRAW RECIRCULATING FURNACE



HEAVY PORTABLE OVEN FURNACE

BENCH OVEN FURNACE

A letter, wire or phone call will promptly bring you information and details on STEWART Furnaces. Or, if you prefer, a STEWART engineer will be glad to call and discuss your heat-treating problems with you.

STEWART INDUSTRIAL FURNACE DIVISION OF CHICAGO FLEXIBLE SHAFT COMPANY

Main Office: 5600 W. Roosevelt Road, Chicago 50, Ill.—*Canada Factory:* (FLEXIBLE SHAFT CO., LTD.) 321 Weston Rd., So., Toronto

Here We Come Hirohito!

• It was not until the internal combustion engine was perfected that the submarine—with a cruising radius of thousands of miles became one of the most potent weapons of war, as the Nipponese well know.

Long experience in serving the automotive industry made Holly a logical source in the production of piston pin retaining rings. Difficult to form and manufactured to precise limits, Holly rings have measurably assisted in the excellent performance of the huge Diesels that are taking our ships to Tokio . . . and back.

Phone Holly 2211 or from Detroit, dial Cherry 4419

AMERICAN SPRING OF HOLLY, INC.
HOLLY, MICHIGAN

Famed Bailey Bridge Units Fabricated By Virginia Bridge Co.

Roanoke, Va.

• • • For more than a year and a half the Roanoke plant of the Virginia Bridge Co., a subsidiary of U. S. Steel Corp., has been engaged in secret production of prefabricated units of the famous British-designed Bailey bridge, the company announced as strict military censorship on these operations was relaxed. In that time more than 200 units of this type panel bridge, which can be quickly assembled, have been turned out by the Virginia plant for the use of American and British invaders of Normandy and Brittany.

Credited by Gen. Bernard Montgomery with much of the swiftness of his successes in Tunisia, Sicily and Italy, the Bailey bridge has become standard equipment for the United States Army, as the ease and speed with which it can be field-assembled cuts delays in the movement of troops and equipment in the wake of enemy demolition. The prefabricated short "panel" sections can be assembled and thrown speedily across any gap up to 240 ft. without the aid of pontoons.

Each unit of the bridge, as built by Virginia Bridge, is the equivalent of a single panel span 300 ft. long or a 150-ft. double span. The capacity of the bridge may be increased at will by adding truss panels, both outside and above the original panel, to a maximum of three high and three wide, such as was used in crossing the Sangro River in Italy, which required a 1200-ft. span.

The bridge is assembled in the field without nuts and bolts, only a steel pin being required for each joint. It takes its name from Donald Coleman Bailey, of the British Ministry of Supply, who played a leading part in its design and development. According to report, Bailey, who had been working on the bridge plan in his own mind for some time, presented the first drawing for it hastily sketched on the back of an envelope. British war officials were so impressed with this rough sketch that within four and a half months they had the first experimental model undergoing trials.

Virginia Bridge Co. has been a principal source of these prefabricated units for the War Department and has been producing them on an around-the-clock schedule. Although these units save much time for the military forces, their production requires the same accuracy and precision workmanship employed in the manufacture of fine machinery, first, because field assembly must be performed quickly, frequently under enemy fire, and, second, because every part of each bridge must be interchangeable with similar units built by other manufacturers in the United States and England.

TAGGING THE ENEMY'S HEELS: *The Bailey bridge, named for a British engineer, units for which are produced by Virginia Bridge Co., U. S. Steel Corp. subsidiary, has been credited with much of the speed of pursuit in the African and Italian campaigns and is now hastening the liberation of France.*

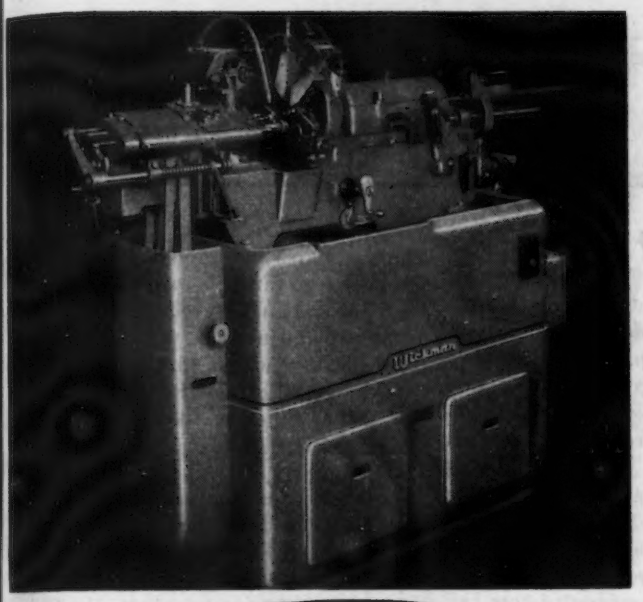
Work Disrupted in Detroit

Detroit

• • • Although Detroit enjoyed a respite from major work disturbances last week, work was disrupted at two plants by labor difficulties.

Gun carriage production was halted at the R. C. Mahon Co. when approximately 475 workers walked out Wednesday in a dispute over transfers.

Work stoppages marred production of amphibious tanks at Graham-Paige Motors Corp., when 525 assemblers and welders were idle intermittently. They are members of Local 142, CIO-UAW.



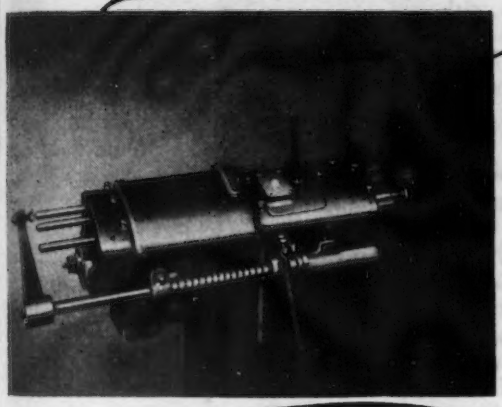
INCREASE VERSATILITY of the Wickman

No. 2

Swiss Type Automatic

With These Attachments

THREE SPINDLE

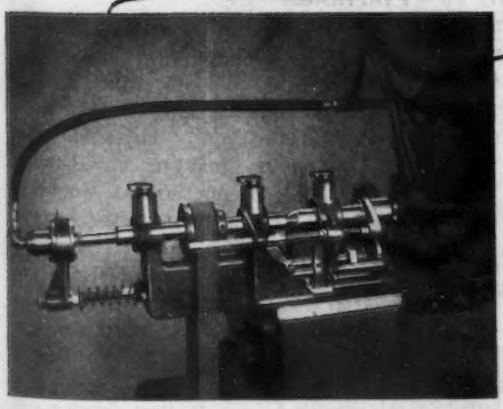


The Three Spindle Attachment provides a means for centering, drilling, reaming, threading and tapping parts produced on the Wickman No. 2 Automatic. The third spindle, which is used for threading, overruns the machine spindle to provide smooth operation without slowing the machine spindle.

DRILLING

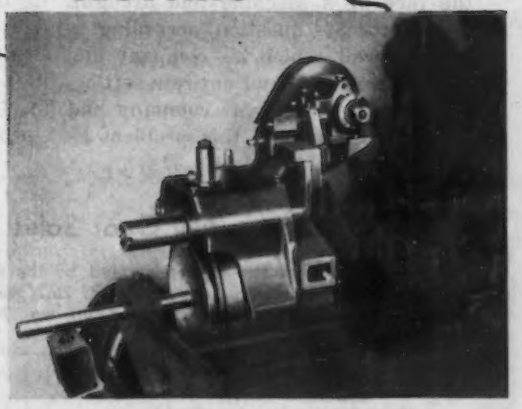
The High Speed Drilling Attachment provides for drilling and reaming operations. The spindle revolves in the opposite direction from the machine spindle to provide high surface speeds with small drills.

THREADING



The Revolving Die Head Threading Attachment is used to chase threads on parts being produced in the Wickman No. 2 Automatic. The Die Head overruns the machine spindle so that precision threading can be done without slowing down the machine spindle.

SLOTTING



This attachment picks the part up as it is being cut off and carries it to a slotting saw. This attachment is independent of the machine and may be used in conjunction with any other attachment.

Although a taper can be generated by a combination of tool and headstock movements, where extreme accuracy is required a taper turning attachment can be supplied. This attachment transfers the taper directly from an accurately ground form-bar to the No. 1 tool.

All Wickman attachments are easily interchangeable and will fit any Wickman No. 2 Swiss Type Automatic.

WICKMAN HIGH PRECISION AUTOMATIC

THE Wickman CORPORATION

15537 WOODROW WILSON AVE.
DETROIT 3, MICHIGAN

MACHINE TOOLS

. . . News and Market Activities

Need for Complementary Product Seen

Cleveland

• • • **Machine tool** builders must stick to the lines for which they have sales and distribution methods established but all machine tool builders are likely to need a complementary product to tide them over the "era of surplus tools" period. This was the conclusion of Charles J. Stillwell, president of Warner & Swasey, who was examining the postwar aspects of the machine tool industry for THE IRON AGE.

The complementary product was sharply emphasized in advantage over any supplementary product which might be added to a tool builder's line since both the old line and the supplementary product would be likely to fail simultaneously if the market went down. On the other hand, citing the familiar ice company which took on the coal business to tide over winter sales, the advantages of a complementary product or line for the machine tool builder were plain to be seen.

The real problem in selecting a complementary line is to find one that can be sold by machinery salesmen yet would have a sustained market in the face of a machine tool drought. This is the $64 question, according to Mr. Stillwell, which his company and many others have not entirely settled.

Mr. Stillwell said his company had started out to solve this problem as early as 1942 by establishing a planning committee made up of engineers who could devote part of their time away from other war duties. He said that this committee had already examined over 550 projects or product offerings and had drawn relatively few recommendations from them to date. Jokingly Mr. Stillwell said that these product offers ran all the way from a super-refrigerator with built-in whoozits to a new fangled cow tail holder, offered by an Iowa woman, who suggested that it could be made and sold for 25c. in competition with a 35c. cow tail holder that Sears-Roebuck offered. Since machinery salesmen could not handle this market, Mr. Stillwell said, the proposal was rejected.

However, the search for a complementary product has not been entirely in vain for Warner & Swasey. When war production will permit, the company has some four or five products which it may begin to produce and market in addition to turret lathes. One experimental model is well under way but remains a closely guarded secret. One of the most difficult features of the search for a complementary product has been that nearly all propositioners wanted the company to do all of the research and iron out all of the kinks from untried projects.

In addition to a complementary product to tide over slack periods in machine tool sales, many machine tool builders also now find that a supplementary product is necessary to fill out the expanded production capacity built up during the war. Warner & Swasey has solved this somewhat by the addition of the Bakewell Tapper to its line plus the possibilities of expanding somewhat on attachment manufacture.

All products contemplated, according to Mr. Stillwell, are carefully eyed for their export possibilities, too. Questioned about the outlook for the machine tool export market, Mr. Stillwell said that much of the decision still hung in the balance. Russia could be an excellent outlet for years, according to Mr. Stillwell, if the government does not force large quantities of government owned surplus tools into this market through lend-lease. This of course would aid the home market if the glut of tools could be shipped abroad rapidly. Warner & Swasey, however, expect to sell directly into some of the most competitive foreign markets through the advantages offered by superior design and workmanship. This seems a plausible goal for many.

•

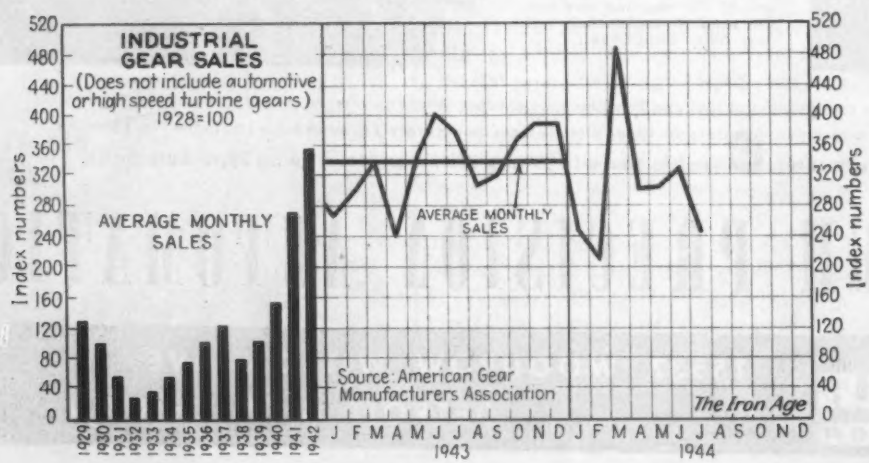
See Business Vacation Influence

Cincinnati

• • • **Totaling of August** business indicates the customary vacation influence in new business, with several companies indicating this month to be poorest of the year. Potential business, however, sustains current optimism and production at undiminished rate for the rest of the year is assured by present backlogs. Government solicitation of suggestions for disposal of surplus war materials has stimulated recommendations from a number of manufacturers. Present in most of their ideas is the desire to save the industry so that dumping is decried. One manufacturer urges no auctions so that speculators will be sidestepped. Further suggestions relate to equipping all government arsenals and shops, giving of new equipment to educational institutions and disposal of remainder under direction of original manufacturer. Under this idea only a small percentage of industrial needs would be supplied from warehouses and bulk from new production thus keeping this basic industry alive.

July Gear Sales Decrease

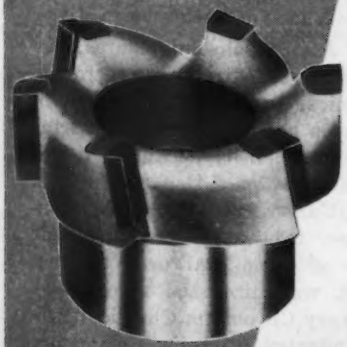
. . . The gearing industry as represented by the members of the American Gear Manufacturers Association shows a decrease of 26.2 per cent in the business booked in July as compared with June. The July index figure was 242.



HERE'S PROOF OF Super Performance!

If you want proof of the time-saving and money-saving performance of Super Carbide Tipped Milling Cutters, look at the production records on jobs where these tools are at work. There you will find Super Milling Cutters setting new standards for speed, accuracy and quality of work. You'll find them saving production costs in many ways . . . increasing table feeds, running longer between grinds, reducing machine down time and providing much longer tool life than other types of milling cutters. For example:

On one job where aluminum castings were being milled, the high speed steel cutter formerly used ran at a speed of 600 RPM with a table feed of 5″ per minute. This cutter ran four hours between grinds. When a Super 6-Tooth Carbide Tipped Cutter (such as shown at the left) was put on the job, the RPM's were stepped up to 1500, the table feed was increased to 20″ per minute, and the Super Cutter ran one week between grinds. An additional saving was made because the Super Cutter ran dry while it was necessary to run the high speed steel cutter wet.



On another job where lugs on a diesel engine crankshaft were being faced off, a 4″ Super Carbide Tipped Shell End Mill (such as shown at left) replaced a high speed steel cutter with the following results: RPM's were stepped up from 90 to 545. Table feed was increased from 1⅛″ per minute to 12½″ per minute. And crankshafts per grind were increased from 4 to 25. On this job the length of the cut was 6″, the depth 3/16″ and the width 1½″. Additional savings were made because the Super Cutter ran dry while the HSS cutter ran wet.

You, too, can get savings like these! Just specify Super Carbide Tipped Cutters on your milling jobs!

WRITE TODAY FOR THIS LITERATURE

Descriptions, illustrations, prices and complete details of Super Carbide Tipped Tools for turning, facing, reaming, spot-facing, forming, grinder rests, wear parts, boring, drilling, grooving, counterboring, shaving, centers and special purposes are given in a series of folders. One or all of these folders will be sent to you upon request. Write today.

SUPER TOOL COMPANY

Carbide Tipped Tools

21650 Hoover Rd., Detroit 13, Mich. 4105 San Fernando Rd., Glendale 4, Cal.

NON-FERROUS METALS

. . . News and Market Activities

Postwar Position of Aluminum Industry Gets Widespread Attention

Washington

• • • **Just as in the case** of steel magnesium and other metal industries that have been expanded by enormous war demands, the puzzle of the postwar position of the aluminum industry is receiving widespread attention. The aluminum problem is interestingly discussed by Walter A. Janssen, chief, Metals and Minerals Unit, Bureau of Foreign and Domestic Commerce, in the August issue of the Survey of Current Business, monthly publication of the Department of Commerce.

Mr. Janssen concedes that the answer to the question of what is to be done with the tremendous aluminum capacity, which has shot up from 327,090,000 lb. in 1939 to a peak of 2,100,000,000 lb. in 1943, of which 55 per cent is government-owned, is a poser. He says that the solution may take more time than did the enormous expansion.

However, in seeking a partial answer, Mr. Janssen points to the historical precedent that no single metal ever replaced another simply because it was in abundant supply, but that on the contrary the eoconomic position of all metals has been enhanced by a transcendent one. Therefore, he says, it is quite possible that the postwar uses will, for the most part, represent a continuation, extension and a balancing of the prewar pattern. A considerable tonnage Mr. Janssen declares, will be represented in those products which were restricted because they were less essential for the war.

The following table is presented by Mr. Janssen to show the principal uses of aluminum by industry in the past and as a postwar forecast:

Percentage of Use

Industry	Nov. 1939	Dec. 1940	May 1943	Post-War
Transportation	29	40	63	34
Cooking Utensils	14	6	1	10
Electrical conductors	10	5	0	8
Machinery and electrical appliances	15	9	6	12
Building construction	8	5	3	9
Chemical	5	5	5	5
Foundry and metal-working	4	23	19	9
Ferrous and nonferrous metallurgy	5	4	2	4
Food and beverages	6	2	0	5
Miscellaneous	4	1	1	4

Among all the estimates for postwar demands, Mr. Janssen says that the figure 900,000,000 lb. is heard most often. Only time, he points out, can give the answers concerning surplus capacity and the place of aluminum when peace is declared. It won't surprise many, it is added, "to find that this most popular estimate is in no way far-fetched—that it may be realized sooner than anticipated."

o o o

Develop Protective Coating for Tinplate

• • • **Conservation of tin** during the war has been made possible by the extended use of electrolytic production of tin plate in which the weight of tin per base box has been dropped to ¾ lb., ½ lb., and now to ¼ lb. for certain applications. The prewar tinplate technique of hot dipping required usually 1½ lb. tin per base box. Even this weight of tin represents an average coating thickness of 0.00009 in. This is much lighter than representative zinc coatings, and only about four times as heavy as the flash coating of chromium normally applied for tarnish resistance.

It is understandable that these tin coatings are not continuous. It has been calculated that there are as many as 100 micropores in the tin coating per sq. in. Protection from corrosion is in general proportionate to the weight of the tin coating. The electrodeposition of tin does not in itself confer marked improvement in resistance to corrosion. Should extended atmospheric exposure be required of such lightly coated tinplate, a protective film will probably be required to prevent corrosion and failure of the minute areas of exposed steel. Such protection is frequently afforded by a supplementary coating of lacquer or enamel.

A protective film may also be developed by the immersion of tin cans in a hot oxidizing and detergent solution. This process has been developed and tested by the British Tin Research Institute who report that the film is invisible and effective against external corrosion. Treated cans are reported to appear bright and more attractive than before. This process can also be applied before fabrication into containers.

•

Chromium Ore Supply Assured

• • • **Military applications,** comprising approximately 87 per cent of the primary chromium chemicals produced in this country, include use in the manufacture of pigments for camouflage, in the tanning of military leather, and in the plating and anodizing operations for aircraft production. The remainder of the output is reserved for civilian needs, such as for the tanning of leather for shoes, the production of pigments, and the dyeing of textiles for men's suits.

South African chromium ores, now used exclusively for primary chromium chemical production, may not be available in adequate quantity during the coming months because of lack of space on ships. Use of Turkish, Russian, Canadian and domestic Montana ores, in the event that ample supplies of Transvaal ores are not imported, was discussed recently by the Primary Chromium Chemical Producers Industry Advisory Committee, the WPB reported.

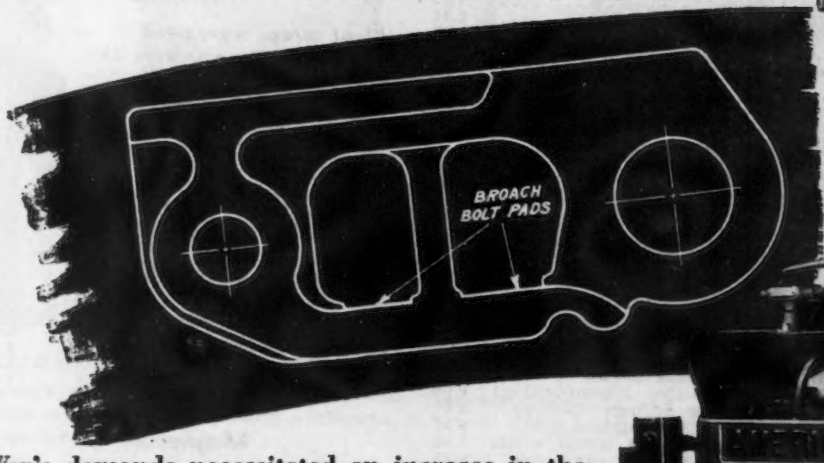
Production problems due to varied ore contents, and price readjustments requiring additional subsidies are obstacles that will probably be encountered in a switch to alternate ores. In an effort to combat production bottlenecks, the Chemicals Bureau has arranged for the installation of improved equipment in many plants. More efficient production technique is expected to boost the output of primary chromium chemicals 10 per cent in 1945, officials said.

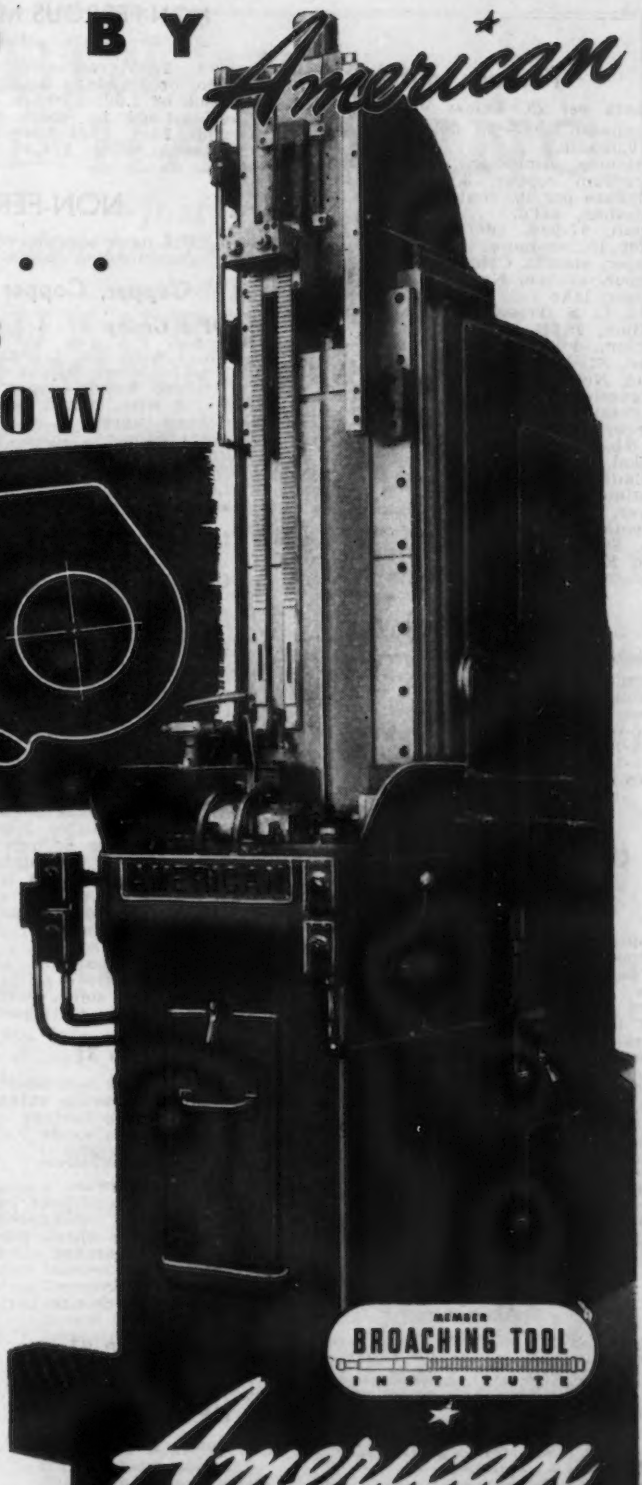
Five of the six existing primary chromium chemical producing plants have arranged to use the higher chrome content Russian ore to augment domestic production during the summer.

BROACHING BY American

PROVEN

on Tanks Today . . .
Ready for Tractors
TOMORROW





War's demands necessitated an increase in the speed of precision production. Broaching met the challenge successfully. Forward-looking manufacturers will plan to cut costs, use manpower efficiently in peacetime by broaching—the *American* way.

Here is a typical example: Increased output, uniform accuracy, and excellent finish are obtained by broaching the internal bolt pads in tank track connector links. An *American* T-15-36 3-way type machine, provided with a manual positioning device to prevent loading a part of the wrong hand, does the work quickly, economically.

Let *American's* complete broaching service—machines, tools, and engineering—help you in war production or in postwar planning. Phone, wire, or write for complete information.

Enlist the services of an expert broach manufacturer when broaching tools are to be designed. Obtain the benefit of his experience.

MEMBER BROACHING TOOL INSTITUTE

American
BROACH AND MACHINE CO.

ANN ARBOR, MICHIGAN

•

BROACHING MACHINES
PRESSES
BROACHING TOOLS
SPECIAL MACHINERY

DIVISION OF SUNDSTRAND MACHINE TOOL CO.

Primary Metals

(Cents per lb. unless otherwise noted)

Aluminum, 99+%, del'd. (Min. 10,000 lb.)	15.00
Antimony, American, Laredo, Tex.	14.50
Beryllium copper, 3.75-4.25% Be; dollars per lb. contained Be	$17.00
Cadmium, del'd.	90.00
Cobalt, 97-99% (dollars per lb.)	$2.11
100 lb. or more	$1.50
Copper, electro. Conn. valley	12.00
Copper, electro. New York	11.75
Copper, lake	12.00
Gold, U. S. Treas., dollars per oz.	$35.00
Indium, 99.5%, dollars per troy oz.	$7.50
Iridium, dollars per troy oz.	$165.00
Lead, St. Louis	6.35
Lead, New York	6.50
Magnesium, 99.9+%, carlots	20.50
Magnesium, 12-in. sticks, carlots	27.50
Mercury, dollars per 76-lb. flask, f.o.b. New York	$103 to $105.00
Nickel, electro	35.00
Palladium, dollars per troy oz.	$24.00
Platinum, dollars per oz.	$35.00
Silver, open market, New York, cents per oz.	44.75
Tin, Straits, New York	52.00
Zinc, East St. Louis	8.25
Zinc, New York	8.67

Remelted Metals

(Cents per lb. unless otherwise noted)

Aluminum, No. 12 Fdy. (No. 2)	12.00
Aluminum, deoxidizing	7.50 to 11.00
Brass Ingot	
88-5-5-5 (No. 115)	13.25
88-10-2 (No. 215)	16.75
88-10-10 (No. 305)	16.00
No. 1 Yellow (No. 405)	10.25

Copper, Copper Base Alloys

(Mill base, cents per lb.)

	Extruded Shapes	Rods	Sheets
Copper	20.87	....	20.37
Copper, H.R.	....	17.37	....
Copper drawn	....	18.37	....
Low brass, 80%	....	20.40	20.15
High brass	....	....	19.48
Red brass, 85%	....	20.61	20.36
Naval brass	20.37	19.12	24.50
Brass, free cut	....	15.01	....
Commercial bronze, 90%	....	21.32	21.07
Commercial bronze, 95%	....	21.53	21.28
Manganese bronze	24.00	....	28.00
Phos. bronze, A, B, 5%	....	36.50	36.25
Muntz metal	20.12	18.87	22.75
Everdur, Herculoy, Olympic or equal	....	25.50	26.00
Nickel silver, 5%	....	28.75	26.50
Architect bronze	19.12	....	....

Aluminum

(Cents per lb., subject to extras on gage, size, temper, finish, factor number, etc.)

Tubing: 2 in. O.D. x 0.065 in. wall 2S, 40c. (½H); 52S, 61c. (O); 24S, 67½c. (T).

Plate: 0.250 in. and heavier: 2S and 3S, 21.2c.; 52S, 24.2c.; 61S, 22.8c.; 24S, 24.2c.

Flat Sheet: 0.188 in. thickness: 2S and 3S, 22.7c. a lb.; 52S, 26.2c.; 61S, 24.7c.; 24S, 26.7c.

2000-lb. base for tubing; 30,000-lb. base for plate, flat stock.

Extruded Shapes: "As extruded" temper; 2000-lb. base, 2S and 3S, factor No. 1 to 4, 25.5c.; 14S, factor No. 1 to 4, 35c.; 17S, factor No. 1 to 4, 31c.; 24S, factor No. 1 to 4, 34c.; 53S, factor No. 1 to 4, 28c.; 61S, factor No. 1 to 4, 28½c.

The factor is determined by dividing perimeter of shape by weight per lineal foot.

Wire Rod and Bar: Base price; 17ST and 11ST-3, screw machine stock. Rounds: ¼ in., 28½c. per lb.; ½ in., 26c.; 1 in., 24½c.; 2 in., 23c. Hexagonals; ¼ in., 34½c. per lb.; ½ in., 28½c.; 1 in., 25½c.; 2 in., 25½c. 2S, as fabricated, random or standard lengths, ¼ in., 24c. per lb.; ½ in., 25c.; 1 in., 24c.; 2 in., 23c. 24ST, rectangles and squares, random or standard lengths. 0.093-0.187 in. thick by 1.001-2.000 in. wide, 33c. per lb.; 0.751-1.500 in. thick by 2.001-4.000 in. wide, 29c.; 1.501-2.000 in. thick by 4.001-6.000 in. wide, 27½c.

Magnesium

Sheet, rod, tubes, bars, extruded shapes subject to individual quotations. Metal turnings: 100 lb. or more, 46c. a lb.; 25 to 90 lb., 56c.; less than 25 lb., 66c.

NON-FERROUS SCRAP METAL QUOTATIONS

†*(OPA basic maximum prices, cents per lb., f.o.b. point of shipment, subject to quality, quantity and special preparation premiums—other prices are current quotations)*

Copper, Copper Base Alloys

OPA Group 1†

No. 1 wire, No. 1 heavy copper	9.75
No. 1 tinned copper wire, No. 1 tinned heavy copper	9.75
No. 2 wire, mixed heavy copper	8.75
Copper tuyeres	8.75
Light copper	7.75
Copper borings	9.75
No. 2 copper borings	8.75
Lead covered copper wire, cable	6.00*
Lead covered telephone, power cable	6.04
Insulated copper	5.10*

OPA Group 2†

Bell metal	15.50
High grade bronze gears	13.25
High grade bronze solids	11.50*
Low lead bronze borings	11.50*
Babbitt lined brass bushings	13.00
High lead bronze solids	10.00*
High lead bronze borings	10.00*
Red trolley wheels	10.75
Tinny (phosphor bronze) borings	10.50
Tinny (Phosphor bronze) solids	10.50
Copper-nickel solids and borings	9.25
Bronze paper mill wire cloth	9.50
Aluminum bronze solids	9.00
Soft red brass (No. 1 composition)	9.00
Soft red brass borings (No. 1)	9.00
Gilding metal turnings	8.50
Contaminated gilded metal solids	8.50
Unlined standard red car boxes	8.25
Lined standard red car boxes	7.75
Cocks and faucets	7.75
Mixed brass screens	7.75
Red brass breakage	7.50
Old nickel silver solids, borings	6.25
Copper lead solids, borings	6.25
Yellow brass castings	6.25

OPA Group 3†

Yellow brass soft sheet clippings	8.625
Yellow rod brass turnings	8.375
Zincy bronze borings	8.00
Zincy bronze solids	8.00
Fired rifle shells	8.25
Brass pipe	7.50
Old rolled brass	7.00
Admiralty condenser tubes	7.50
Muntz metal condenser tubes	7.00
Plated brass sheet, pipe reflectors	6.50
Manganese bronze solids	7.25[1]
Manganese bronze solids	6.25[2]
Manganese bronze borings	6.50[1]
Manganese bronze borings	5.50[2]

OPA Group 4†

Automobile radiators	7.00

OPA Group 5†

Refinery brass	5.00*

*Price varies with analysis. [1] Lead content 0.00 to 0.40 per cent. [2] Lead content 0.41 to 1.00 per cent.

Other Copper Alloys†

Briquetted Cartridge Brass Turnings	8.625
Cartridge Brass Turnings, Loose	7.875
Loose Yellow Brass Trimmings	7.875

Aluminum

Plant scrap, segregated

All S-type alloys (except 2S)	6.00
2s solids	7.50
High grade alloys (cast)	6.00
Low grade alloys	4.00
Borings and turnings	
High grade alloys	4.00
Low grade alloys	2.50

Plant scrap, mixed

All solids	4.00
Borings and turnings	2.25

Obsolete scrap

Pure cable	7.00
Old sheet and utensils	6.00
Old castings and forgings	5.00
Pistons, free of struts	4.50
Pistons, with struts	2.50
Old alloy sheet	4.00

Magnesium

Segregated plant scrap

Pure solids and all other solids, exempt	
Borings and turnings	3.00

Mixed, contaminated plant scrap

Grade 1 solids	6.00
Grade 1 borings and turnings	3.00
Grade 2 solids	3.00
Grade 2 borings and turnings	2.00

Zinc

New zinc clippings, trimmings	6.50
Engravers' lithographers plates	6.50
Old zinc scrap	5.25
Unsweated zinc dross	5.50
Die cast slab	5.00
New die cast scrap	4.95
Radiator grilles, old and new	4.00
Old die cast scrap	3.50

Lead

Deduct 0.55c. a lb. from refined metal basing point prices or soft and hard lead inc. cable, for f.o.b. point of shipment price.

Nickel

Ni content 98+%, Cu under ½%, 26c. per lb.; 90 to 98% Ni, 26c. per lb. contained Ni.

ELECTROPLATING ANODES AND CHEMICALS

Anodes

(Cents per lb., f.o.b. shipping point)

Copper: Cast, elliptical, 15 in. and longer	25⅛
Electrolytic, full size	22⅞
cut to size	30⅛
Rolled, oval, straight, 15 in. and longer	23¼
Curved	24¼
Brass Cast, 82-20, elliptical, 15 in. and longer	23⅝
Zinc: Cast, 99.99, 16 in. and over	16¼
Nickel: 99% plus, cast	47
Rolled, depolarized	48
Silver: Rolled, 999 fine per Troy (1-9) oz., per oz.	58

Chemicals

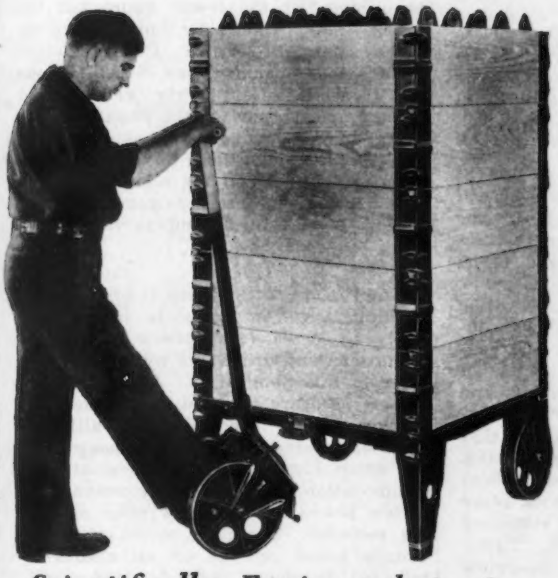
(Cents per lb., delivery from New York)

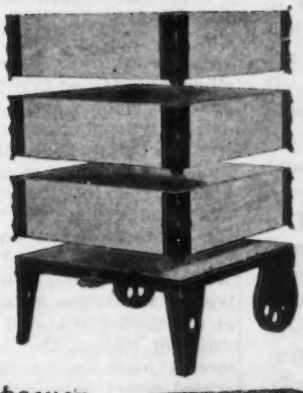
Copper cyanide, tech., 100-lb. bbls. 1-5	5.65
Copper sulphate, 99.5 crystals, bbls.	13.00-13.50
Nickel salts, single, 425-lb. bbls.	34.00
Silver cyanide, 100 oz., lots	40.82-41.125
Sodium cyanide, 96% dom., 100-lb. dms.	0.15
Zinc cyanide, 100-lb. dms.	33.00
Zinc, sulphate, 89% crystals, bbls.	6.80

DELIVER THE BIN AND SAVE THE HANDLING

—just one of many Labor and Cost Saving Features you get in the

TURNER SYSTEM OF MATERIALS HANDLING

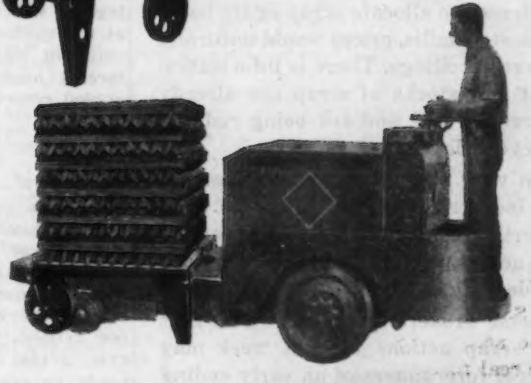


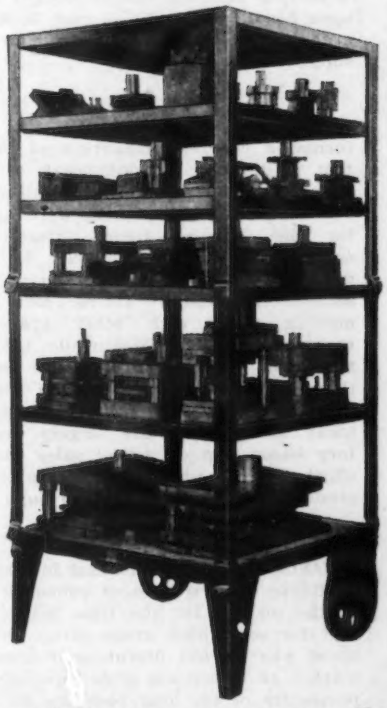


Portable Interlocking Bin Sections fit on the Turner Transport and are quickly moved with the Jimmy. As load diminishes Bin Sections are removed and placed on "empty" to build its capacity.

Scientifically Engineered to Save Manpower

Through standardization the Turner System promotes orderliness and eliminates "lost motion" among employees. Increases profits because it saves time, labor and space.





The ceiling is the limit for vertical expansion with the Turner System. Units moved by all modern methods.

Send For This Book

The whole story of the Turner System is presented in this new book which is sent free to established companies.

Wheeling Shop Box with Boxes added, moved with Shop Box Jimmy.

Simplifies Your Die Handling Problems

Rugged Die Racks interlock on the Turner Transport and dies may be quickly moved to any part of the shop. Dies are always visible and easily accessible.

FACTORY SERVICE COMPANY

4621 NORTH TWENTY-FIRST STREET — MILWAUKEE 9, WISCONSIN

SCRAP

. . . News and Market Activities

Complete Apathy Features Market

• • • After last week's news of the break in prices in many districts of all grades of scrap except cast products, severe apathy seems to have descended upon markets throughout the country. It will be observed that there is an impression conveyed by many of the district reports that the prices quoted are nominal, since they are based upon the last reported sales. It is predicted in the trade that should the war in Europe not come to a definite termination within the next month, the mills may be found in an embarrassing position with regard to their inventories of scrap iron and steel. If, for example, WPB should be forced to allocate scrap again widely to steel mills, prices would naturally revert to ceilings. There is information that mill stocks of scrap are already extremely low, and are being reduced by every day's operation.

In view of the market conditions in the industry, THE IRON AGE this week reverts to its former practice of reporting actual prices at which the various grades are actually selling.

Some brokers and dealers feel that the scrap actions in past week may be real forerunners of an early ending of the war with Germany. It is realized that there is some chance being taken but it is said that after all the prices have become softer, demand has fallen off and no one can make the buyer purchase or the broker buy from a dealer when he in turn has no commitment. Old timers in the scrap market say that the trends which have occurred in the past week have all the signs of a lower market with more downward trends regardless of what happens in the near future. It is more a question of lack of actual demand at present prices rather than any attempt to tie in the present status of the market with the inventory position. It is pointed out that what is a big pile of scrap today at present rates may be even much larger if the ingot rate goes down.

•

PITTSBURGH — There are no buyers of heavy melting steel in the market this week here. It is believed that dealers' order books are smaller today than at any time since the war started. Mills are not evidencing any interest in new orders and are cancelling out quite heavily on old orders. Actually, it has reached the point here where the prices on most grades are nominal, since no sales are being made and no one knows for certain what prices can be obtained when sales pick up again.

•

CHICAGO — Although no widespread price breaks had yet occurred in the Chicago district as this was written, resistance to lower offers appeared to be slight and one or two transactions below previous quotations might prove to be extremely contagious. Two factors contributing to this situation were the continued building up of stocks in hands of producers in the absence of demand, and the trend of one of the principal consumers towards an operating rate that would provide virtual self sufficiency. With the exception of machine shop turnings in which one transaction took place at the quoted price, the market remained stagnant during the past week. Therefore it must be emphasized that prices quoted reflect only the most recent transaction.

•

BOSTON — With Pittsburgh district mills apparently out of the market, eastern Pennsylvania only buying at cutback prices, Bethlehem Steel cancelling its Lackawanna allocations, yards withdrawing offerings and brokers at sea on prices, the market is so confused that few reliable values are obtainable. However, actual sales of turnings have been made to eastern Pennsylvania mills at $7.65 a ton, blast furnace material at $7.50, and heavy steel at $12.75. Breakable cast and stove plate are holding at ceilings.

•

NEW YORK—The volume of transactions has been dropping for some time in this area but recent reports indicate that a new low has been reached this week. Dealers report that the price range established last week of $1.00 below ceilings for all grades except cast, which remain at ceilings, is still holding firm. Lack of sales and general market apathy indicate the possibility of a further subsequent drop. The Charles Dreifus Iron and Steel Corp., of Brooklyn, has established an office at 61 Broadway, New York City. While its operations are to continue to a limited extent at the yard at 230 Morgan Ave., Brooklyn, the latter is now identified as Leiberman Koren Co.

•

PHILADELPHIA — In spite of the drop in the price of heavy melting steel scrap, consumers have not shown much interest in scrap purchases. Conditions are unchanged from last week with several mills still restricting incoming scrap.

•

BUFFALO—Bethlehem is reported bidding $18.25 for No. 1 heavy melting scrap, $1 below the ceiling, in the first move in this district to crack prices on this item. Dealers say no sales have been made at the lower figure but the break may come by mid-September when contracts expire. On the other hand some consumers say No. 1 is none too plentiful here. Fairly well stocked dealers are alarmed at the situation. Machine shop turnings have slumped and dealers have cut their buying prices a dollar, to $10 a ton for alloy-free offerings. Prices to consumers remain at $13 to $14.25 with little stuff moving.

•

CLEVELAND—Business is almost nonexistant but the trade is being kept lively by a case of jitters over price quotations appearing this week and hereafter in this publication. All major consumers here are reported out of the market for possibly 30 days or more although some optimists here anticipate some buying after Labor Day. Some small accommodation sales are being made here at low prices but very few sales are being recorded. The price structure is obviously below ceilings on all grades as reflected in the Cleveland price quotations this week. Yards likewise are buying as cheaply as possible and unprepared scrap is going at from $3.50 to $5.00 under ceilings. No electric furnace is moving here but can be bought at the open hearth price. No. 1 cast is the one grade reported holding firm due to short supply.

•

DETROIT—A Chrysler list last week furnished concrete indication of the extent of the scrap price break the first since quotations crumbled. Although the customary number of bids were entered for the Chrysler items, interest was notably lacking particularly in alloy grades. Signs pointed to a price based somewhere around $15.75 for heavy melting steel, with other grades in rough correlation. Meanwhile the only movement of scrap here is to destinations out of the city, and these are thin and uncertain. Many prices being quoted today as a result, are largely exploratory based less on actual sales than on efforts to feel out the willingness of both producers to sell and mills to buy.

•

CINCINNATI—The market in this area continues quiet with most consumers out of the market for the time being. Except for some high grade scrap, the demand has all but disappeared from the market as consumers seek to escape the possibility of too long positions on scrap supplies. Current sales are, however, at the ceiling and dealers show no indication of wanting to soften the present prices.

•

BIRMINGHAM—There is very little demand here for any type of material and prices are expected to drop further when consumers again get into the market in a substantial manner. No springboard on any item is being allowed at present.

IRON AND STEEL SCRAP PRICES

[Going prices as obtained in the trade by IRON AGE editors, based on representative tonnages (for ceiling prices see O. P. A. schedule No. 4)
Note: All cast grades shown here are O. P. A. ceilings, f.o.b. shipping point]

PITTSBURGH

Per gross ton delivered to consumer:

No. 1 hvy. melting	$19.50 to	$20.00
RR hvy. mltng. steel	....	21.00
No. 2 hvy. melting	19.50 to	20.00
Railroad scrap rails	....	21.50
Rails, 3 ft. and under	....	23.50
Compressed sheet stl.	19.50 to	20.00
Hand bundled new sheets	19.50 to	20.00
Hvy. axle turnings	....	19.50
Hvy. forge turnings	....	19.50
Machine shop turn'gs	14.50 to	15.00
Shovel. turnings, alloy free	16.50 to	17.00
Mixed bor. & turn.	14.50 to	15.00
Cast iron borings	15.50 to	16.00
Hvy. breakable cast.	....	16.50
No. 1 cupola cast	....	20.00
RR knuckles and couplings	24.00 to	24.50
RR coil springs	24.00 to	24.50
RR leaf springs	24.00 to	24.50
RR rolled steel whls.	24.00 to	24.50
Low phos. billet crops	....	25.00
Low phos. punchings	....	22.50
Railroad malleable	....	22.00

CHICAGO

Per gross ton delivered to consumer

No. 1 hvy. melting	....	$18.75
No. 2 hvy. melting	....	18.75
No. 1 bundles	....	18.75
Bndld. mach. shop. turnings	....	18.75
Galv. bundles (No. 3)	....	16.75
Mach. shop turnings	....	11.00
Short shoveling trngs.	....	13.75
Cast iron borings	....	12.75
Mix bor. & short turn.	....	12.75
Low phos. hvy. forge	....	23.75
Low phos. plates	....	21.25
"On-Line" Prices Railroad Scrap:		
No. 1 RR hvy. mltng.	....	19.75
No. 2 RR hvy. mltng.	....	19.75
Flues, tubes & pipes.	....	16.25
Reroll rails	....	22.25
Cut rails, 3 ft. and under	....	22.25
Locomotive tires, cut	....	24.25
Cut bolsters & side frames	....	22.25
Angle & splice bars	....	22.25
No. 3 steel wheels	....	23.25
Couplers & knuckles	....	23.25
Cut rails, 2 ft. and under	....	23.50
Miscellaneous rails	....	20.50
St'dard stl. car axles	....	25.75
No. 1 mach. cast	....	20 00
No. 1 agricul. cast	....	20.00
Cast iron car wheels	....	20.00
Hvy. breakable cast.	....	16.50
RR grate bars	....	15.25
Brake shoes	....	15 25
Stove plate	....	19.00
Clean auto cast	....	20.00
Agricul. malleable	....	22.00
RR malleable	....	22.00

DETROIT

Per gross ton, brokers' buying prices:

No. 1 hvy. melting	$15.50 to	$16.00
No. 1 hyd. comp. sh'ts	15.50 to	16.00
No. 2 hvy. melting	15.50 to	16.00
No. 1 bundles	15.50 to	16.00
New busheling	15.50 to	16.00
Mach. shop turnings	10.00 to	10.50
Short shov. turnings	12.00 to	12.50
Cast iron borings	11.00 to	11.50
Mixed bor. & turns.	10.00 to	10.50
No. 1 cupola cast	....	20.00
Charging box cast	....	19.00
Hvy. breakable cast	....	16.50
Stove plate	....	19.00
Flashings	15.00 to	15.50
Low phos. plate	17.00 to	18.00
Automotive cast	....	20.00

YOUNGSTOWN

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.50 to	$19.50
No. 2 hvy. melting	18.50 to	19.50
Low phos plate	20.00 to	21.00
No. 2 busheling	18.50 to	19.50
Hydraulic bundles	18.50 to	20.50
Mach. shop turnings	14.50 to	15.50
Short shovel. trngs.	16.00 to	16.50
Cast iron borings	15.00 to	15.50

CLEVELAND

Per gross ton delivered to consumer:

No. 1 hvy. melting	$18.00 to	$19.00
No. 2 hvy. melting	18.00 to	19.00
Compressed sheet stl.	18.00 to	19.00
Drop forge flashings	18.00 to	19.00
Mach. shop turnings	13.00 to	14.00
Short shovel. trngs.	15.00 to	16.00
No. 2 busheling	18.00 to	19.00
Steel axle turnings	17.50 to	18.50
Low phos. billet and bloom crops	24.00 to	24.50
Cast iron borings	14.00 to	15.00
Mixed bor. & turns.	13.00 to	14.00
No. 2 busheling	15.50 to	16.50
No. 1 machine cast	....	20.00
Railroad cast	....	20.00
Railroad grate bars	....	15.25
Stove plate	....	19.00
Rails 3 ft. & under	....	23.00
Rails 18 in. & under	....	24.25
Rails for rerolling	....	23.00
Railroad malleable	....	22.00
Elec. furnace punchings	19.50 to	20.50

Scrap Prices Changed

• • • Since April, 1941, The Iron Age has each week listed OPA ceilings on steel and iron scrap prices as representing the best available quotation in view of the pressures of war demands, the shortage of scrap and the rigid governmental control of prices. Now, due to larger stocks seeking outlets and the tendency of the market to discount victories abroad, scrap prices are fluctuating and sagging under ceiling levels, not only on the secondary grades but also in the very important primary heavy melting grades. The Iron Age believes that the time has come to go back to its own method of quoting scrap prices, in order that quotations for various grades be representative of actual market conditions.

Because market conditions are currently in a state of flux, with brokers and dealers engaged in rewriting contracts and involved in the complexities of change-over, coupled with reluctance of many buyers to take tonnages at this time, it may be several weeks yet before all prices settle to a relatively routine pattern of change and inter-relationship.

BUFFALO

Per gross ton delivered to consumer:

No. 1 hvy. melting	....	$19.25
No. 1 bundles	....	19.25
No. 2 bundles	....	19.25
No. 2 hvy. melting	....	19.25
Mach. shop turnings	13.00 to	14.25
Shoveling turnings	....	16.25
Cast iron borings	....	15.25
Mixed bor. & turns.	....	14.25
No. 1 cupola cast	....	20.00
Stove plate	....	19.00
Low phos. plate	....	21.75
Scrap rails	....	20.75
Rails 3 ft. & under	....	22.75
RR steel wheels	....	23.75
Cast iron car wheels	....	20.00
RR coil & leaf sprgs.	....	23.75
RR knuckles & coup.	....	23.75
RR malleable	....	22.00
No. 1 busheling	....	19.25

BOSTON

Dealers' buying prices per gross ton, f.o.b. cars

No. 1 hvy. melting	$13.75 to	$14.00
Breakable cast	....	16.50
Turnings, shovelings	....	12.05
Mixed alloy turnings	8.00 to	9.06
Mixed bor. & turns.	....	8.00
Bundled skeleton	13.75 to	14.00
Stove plate	....	19.00

PHILADELPHIA

Per gross ton delivered to consumer:

No. 1 hvy. melting	$17.75 to	$18.25
No. 2 hvy. melting	17.75 to	18.25
Mach. shop turnings	12.50 to	13.00
Shoveling turnings	14.50 to	15.00
Cast iron borings	13.50 to	14.00
Mixed bor. & turns.	12.50 to	13.00
No. 1 cupola cast	....	20.00
Hvy. breakable cast.	....	16.50
Hvy. axle turnings	17.25 to	17.75
Hvy. forge turnings	17.25 to	17.75
Low phos. plate	20.00 to	20.50
Billet crops	....	22.00

ST. LOUIS

Dealers' buying prices per gross ton delivered to consumer:

Hvy. melting	....	$17.50
No. 1 locomotive tires	....	21.00
Misc. stand. sec. rails	....	19.00
Railroad springs	....	22.00
Bundled sheets	....	17.50
Heavy turnings	....	16.75
Rerolling rails	....	21.00
Steel car axles	....	23.50
Steel rails under 3 ft.	....	21.50
Steel angle bars	....	21.00
Cast iron car wheels	....	20.00
No. 1 machinery cast	....	20.00
Railroad malleable	....	22.00
Breakable cast	....	16.50
Stove plate	....	19.00
Grate bars	....	15.25
Brake shoes	....	15.25

BIRMINGHAM

Per gross ton delivered to consumer:

No. 1 hvy. melting	....	$17.00
No. 2 hvy. melting	....	17.00
No. 2 bundles	....	16.00
No. 1 busheling	....	15.00
Scrap rails	....	17.00
Rails 3 ft. & under	....	19.00
Angle & splice bars	....	17.00
Cast iron borings	....	12.00
Steel axles	....	17.00
No. 2 RR wrought	....	17.00

NEW YORK

Dealers' buying prices, per gross ton, on cars:

No. 1 hvy. melting	$14.00 to	$14.50
No. 2 hvy. melting	14.00 to	14.50
Hvy. breakable cast	....	16.50
Charging box cast	....	19.00
No. 1 cupola cast	....	20.00
Stove plate	....	19.00
No. 1 busheling	14.00 to	14.50
Hyd. comp. black bundles	14.00 to	14.50
Hyd. comp. galv. bundles	12.00 to	12.50
Clean chem. cast bor.	....	14.33
Mach. shop turnings	9.25 to	9.75
Mixed bor. & turns.	9.25 to	9.75
Clean auto cast	....	20.00
Unstrip. motor blks.	....	17.50

Per gross ton, delivered local foundries

No. 1 cupola cast	$20.25 to	$20.75

CINCINNATI

Per gross ton delivered to consumer:

No. 1 hvy. melting	....	$19.50
No. 2 hvy. melting	....	19.50
Mach. shop turnings	....	19.50
Shoveling turnings	....	16.50
Cast iron borings	....	15.50
Mixed bor. & Turns.	....	14.50
No. 1 cupola cast	....	20.00
Hvy. breakable cast.	....	16.50
Low phos. plate	....	22.00
Scrap rails	....	21.00

PACIFIC COAST

Per gross ton delivered to consumer:

No. 1 hvy. melting	$14.00 to	$15.58
RR hvy. melting	....	15.58
No. 2 hvy. melting	13.00 to	14.58
Mach. shop turnings	4.00 to	6.00
Scrap rails	....	15.58

Comparison of Prices . . .

Advances Over Past Week in Heavy Type; Declines in *Italics*. [Prices Are F.O.B. Major Basing Points]

Flat Rolled Steel: (Cents Per Lb.)	Aug. 29 1944	Aug. 22 1944	July 25 1944	Aug. 31 1943
Hot rolled sheets	2.10	2.10	2.10	2.10
Cold rolled sheets	3.05	3.05	3.05	3.05
Galvanized sheets (24 ga.)	3.50	3.50	3.50	3.50
Hot rolled strip	2.10	2.10	2.10	2.10
Cold rolled strip	2.80	2.80	2.80	2.80
Plates	2.10	2.10	2.10	2.10
Plates, wrought iron	3.80	3.80	3.80	3.80
Stain's c.r. strip (No. 302)	28.00	28.00	28.00	28.00
Tin and Terne Plate: (Dollars Per Base Box)				
Tin plate, standard cokes	$5.00	$5.00	$5.00	$5.00
Tin plate, electrolytic	4.50	4.50	4.50	4.50
Special coated mfg. ternes	4.30	4.30	4.30	4.30
Bars and Shapes: (Cents Per Lb.)				
Merchant bars	2.15	2.15	2.15	2.15
Cold finished bars	2.65	2.65	2.65	2.65
Alloy bars	2.70	2.70	2.70	2.70
Structural shapes	2.10	2.10	2.10	2.10
Stainless bars (No. 302)	24.00	24.00	24.00	24.00
Wrought iron bars	4.40	4.40	4.40	4.40
Wire and Wire Products: (Cents Per Lb.)				
Plain wire	2.60	2.60	2.60	2.60
Wire nails	2.55	2.55	2.55	2.55
Rails: (Dollars Per Gross Ton)				
Heavy rails	$40.00	$40.00	$40.00	$40.00
Light rails	40.00	40.00	40.00	40.00
Semi-Finished Steel: (Dollars Per Gross Ton)				
Rerolling billets	$34.00	$34.00	$34.00	$34.00
Sheet bars	34.00	34.00	34.00	34.00
Slabs, rerolling	34.00	34.00	34.00	34.00
Forging billets	40.00	40.00	40.00	40.00
Alloy blooms, billets, slabs	54.00	54.00	54.00	54.00
Wire Rods and Skelp: (Cents Per Lb.)				
Wire rods	2.00	2.00	2.00	2.00
Skelp	1.90	1.90	1.90	1.90

Pig Iron: (Per Gross Ton)	Aug. 29 1944	Aug. 22 1944	July 25 1944	Aug. 31 1943
No. 2 fdy., Philadelphia	$25.84	$25.84	$25.84	$25.89
No. 2, Valley furnace	24.00	24.00	24.00	24.00
No. 2, Southern Cin'ti	25.11	25.11	25.11	24.68
No. 2, Birmingham	20.38	20.38	20.38	20.38
No. 2, foundry, Chicago†	24.00	24.00	24.00	24.00
Basic, del'd eastern Pa.	25.34	25.34	25.34	25.39
Basic, Valley furnace	23.50	23.50	23.50	23.50
Malleable, Chicago†	24.00	24.00	24.00	24.00
Malleable, Valley	24.00	24.00	24.00	24.00
L. S. charcoal, Chicago	37.34	37.34	37.34	31.34
Ferromanganese‡	135.00	135.00	135.00	135.00

†The switching charge for delivery to foundries in the Chicago district is 60c. per ton.
‡For carlots at seaboard.

Scrap: (Per Gross Ton)				
Heavy melt'g steel, P'gh.	*$19.76*	$20.00	$20.00	$20.00
Heavy melt'g steel, Phila.	*18.00*	18.75	18.75	18.75
Heavy melt'g steel, Ch'go	18.75	18.75	18.75	18.75
No. 1 hy. comp. sheet, Det.	*15.25*	17.85	17.85	17.85
Low phos. plate, Youngs'n	*20.50*	22.50	22.50	22.50
No. 1 cast, Pittsburgh	20.00	20.00	20.00	20.00
No. 1 cast, Philadelphia	20.00	20.00	20.00	20.00
No. 1 cast, Ch'go	20.00	20.00	20.00	20.00
Coke, Connellsville: (Per Net Ton at Oven)				
Furnace coke, prompt	$7.00	$7.00	$7.00	$6.50
Foundry coke, prompt	8.25	8.25	8.25	7.50
Non-Ferrous Metals: (Cents per Lb. to Large Buyers)				
Copper, electro., Conn.	12.00	12.00	12.00	12.00
Copper, Lake	12.00	12.00	12.00	12.00
Tin (Straits), New York	52.00	52.00	52.00	52.00
Zinc, East St. Louis	8.25	8.25	8.25	8.25
Lead, St. Louis	6.35	6.35	6.35	6.35
Aluminum, Virgin, del'd	15.00	15.00	15.00	15.00
Nickel, electrolytic	35.00	35.00	35.00	35.00
Magnesium, ingot	20.50	20.50	20.50	20.50
Antimony, Laredo, Tex.	14.50	14.50	14.50	14.50

The various basing points for finished and semi-finished steel are listed in the detailed price tables, pages 118-125.

Composite Prices . . .

Starting with the issue of April 22, 1943, the weighted finished steel price index was revised for the years 1941, 1942 and 1943. See explanation of the change on page 90 of the April 22, 1943, issue.

	FINISHED STEEL	PIG IRON	SCRAP STEEL
August 29, 1944	2.25513c. a Lb.	$23.61 a Gross Ton	*$18.84* a Gross Ton
One week ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One month ago	2.25513c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton
One year ago	2.26190c. a Lb.	$23.61 a Gross Ton	$19.17 a Gross Ton

	FINISHED STEEL HIGH	FINISHED STEEL LOW	PIG IRON HIGH	PIG IRON LOW	SCRAP STEEL HIGH	SCRAP STEEL LOW
1943	2.25513c.,	2.25513c.,	$23.61	$23.61	$19.17	$19.17
1942	2.26190c.,	2.26190c.,	23.61	23.61	19.17	19.17
1941	2.43078c.,	2.43078c.,	$23.61, Mar. 20	$23.45, Jan. 2	$22.00, Jan. 7	$19.17, Apr. 10
1940	2.30467c., Jan. 2	2.24107c., Apr. 16	23.45, Dec. 23	22.61, Jan. 2	21.83, Dec. 30	16.04, Apr. 9
1939	2.35367c., Jan. 3	2.26689c., May 16	22.61, Sept. 19	20.61, Sept. 12	22.50, Oct. 3	14.08, May 16
1938	2.58414c., Jan. 4	2.27207c., Oct. 18	23.25, June 21	19.61, July 6	15.00, Nov. 22	11.00, June 7
1937	2.58414c., Mar. 9	2.32263c., Jan. 4	23.25, Mar. 9	20.25, Feb. 16	21.92, Mar. 30	12.67, June 8
1936	2.32263c., Dec. 28	2.05200c., Mar. 10	19.74, Nov. 24	18.73, Aug. 11	17.75, Dec. 21	12.67, June 9
1935	2.07642c., Oct. 1	2.06492c., Jan. 8	18.84, Nov. 5	17.83, May 14	13.42, Dec. 10	10.33, Apr. 29
1934	2.15367c., Apr. 24	1.95757c., Jan. 2	17.90, May 1	16.90, Jan. 27	13.00, Mar. 13	9.50, Sept. 25
1933	1.95578c., Oct. 3	1.75836c., May 2	16.90, Dec. 5	13.56, Jan. 3	12.25, Aug. 8	6.75, Jan. 3
1932	1.89196c., July 5	1.83901c., Mar. 1	14.81, Jan. 5	13.56, Dec. 6	8.50, Jan. 12	6.43, July 5
1931	1.99626c., Jan. 13	1.86586c., Dec. 29	15.90, Jan. 6	14.79, Dec. 15	11.33, Jan. 6	8.50, Dec. 29
1930	2.25488c., Jan. 7	1.97319c., Dec. 9	18.21, Jan. 7	15.90, Dec. 16	15.00, Feb. 18	11.25, Dec. 9
1929	2.31773c., May 28	2.26498c., Oct. 29	18.71, May 14	18.21, Dec. 17	17.58, Jan. 29	14.08, Dec. 3

Weighted index based on steel bars, beams, tank plates, wire, rails, black pipe, hot and cold-rolled sheets and strip, representing 78 per cent of the United States output. Index recapitulated in Aug. 28, 1941, issue.

Based on averages for basic iron at Valley furnaces and foundry iron at Chicago, Philadelphia, Buffalo, Valley and Southern iron at Cincinnati.

Based on No. 1 heavy melting steel scrap quotations to consumers at Pittsburgh, Philadelphia and Chicago.

GREATER UNIT LOADS

..and a safer, speedier handling and stacking system..

The "AUTOMATIC" Fork Lift Truck is an all-around fast, sure, and low-cost worker. It affords greatest flexibility whether for multi-stacking, loading, shipping, or transportation in plant or yard.

A woman can handle tons per day unassisted and through her simplified efforts inject cost-savings throughout the plant.

You conserve much needed floor space thru high orderly stacks—fully utilizing overhead space.

. . . . Write for further details on "AUTOMATIC" Fork Lift Trucks and their application to handling and stacking problems such as yours.

MANUFACTURERS FOR OVER THIRTY FIVE YEARS *Electric Propelled* INDUSTRIAL TRUCKS

AUTOMATIC TRANSPORTATION CO.

DIV. OF THE YALE & TOWNE MFG. CO.

75 WEST 87th STREET CHICAGO 20, ILLINOIS

WAREHOUSE PRICES

Delivered metropolitan areas per 100 lb. These are zoned warehouse prices in conformance with latest zoning amendment to OPA Price Schedule 49.

Cities	SHEETS			STRIP		Plates ¼ in. and heavier	Structural Shapes	BARS		ALLOY BARS			
	Hot Rolled (10 gage)	Cold Rolled	Galvanized (24 gage)	Hot Rolled	Cold Rolled			Hot Rolled	Cold Finished	Hot Rolled, NE 8617-20	Hot Rolled, NE 9442-45 Ann.	Cold Drawn, NE 8617-20	Cold Drawn, NE 9442-45 Ann.
**Philadelphia	3.518	4.8728	5.018a	3.922	4.772	3.605	3.666	3.822	4.072	5.966	7.066	7.272	8.322
New York	3.590	4.6123	5.010	3.9746	4.772	3.788	3.788	3.853	4.103	6.008	7.108	7.303	8.353
Boston	3.744	4.7449	5.2249	4.106	4.715	3.912	3.912	4.044	4.144	6.162	7.262	7.344	8.394
Baltimore	3.394	4.852	4.894	3.902	4.752	3.594	3.769	3.802	4.052	....	....	....	....
Norfolk	3.771	4.965	5.371	4.165	4.865	3.971	4.002	4.065	4.165	....	....	....	....
Chicago	3.25	4.20	5.231	3.60	4.6817	3.55	3.55	3.50	3.75	5.75	6.85	6.85	7.90
Milwaukee	3.387	4.3373	5.2724	3.737	4.78717	3.687	3.687	3.637	3.887	5.987	7.087	7.087	8.137
Cleveland	3.35	4.40	4.8774	3.60	4.45	3.40	3.588	3.35	3.75	5.956	7.056	6.85	7.90
Buffalo	3.35	4.40	4.754	3.819	4.669	3.63	3.40	3.35	3.75	5.75	6.85	6.85	7.90
Detroit	3.45	4.50	5.004	3.70	4.66917	3.609	3.661	3.45	3.80	6.08	7.18	7.159	8.209
Cincinnati	3.425	4.4783	4.8255	3.675	4.711	3.611	3.691	3.611	4.011	....	....	....	....
St. Louis	3.397	4.3473	5.1724	3.747	4.93117	3.697	3.697	3.647	4.031	6.131	7.231	7.231	8.281
Pittsburgh	3.35	4.40	4.75	3.60	4.45	3.40	3.40	3.35	3.75	5.75	6.85	6.85	7.90
St. Paul	3.51	4.48	5.2574	3.86	4.3517	3.8113	3.8113	3.7613	4.361	6.09	7.19	7.561	8.711
Omaha	3.865	5.443	5.6084	4.215	....	4.165	4.165	4.115	4.43	....	....	....	....
Indianapolis	3.58	3.58	4.568	4.918	3.768	4.78	3.63	3.58	3.98	8.08	7.18	7.18	8.23
Birmingham	3.45	....	4.75	3.70	....	3.55	3.55	3.50	4.43	....	....	....	....
Memphis	3.9657	4.66	3.265	4.215	....	4.065	4.065	4.015	4.33	....	....	....	....
New Orleans	4.058*	4.95	5.358	4.308	....	4.158	4.158*	4.108*	4.629	....	....	....	....
Houston	3.763	5.573	6.3131	4.313	....	4.25	4.25	3.75	6.3733	7.223	8.323	8.323	9.373
Los Angeles	5.00	7.203	6.104	4.95	5.61315	4.95	4.65	4.40	5.583	8.304	9.404	9.404	10.454
San Francisco	4.5514	7.304	6.354	4.5014	7.33317	4.6514	4.3514	4.1514	5.333	8.304	9.404	9.404	10.454
Seattle	4.6512	7.054	5.954	4.2512	....	4.7512	4.4512	4.3512	5.783	....	9.404	....	....
Portland	4.6511	6.604	5.754	4.7511	....	4.7511	4.4511	4.4511	5.533	8.304	9.404	8.304	9.404
Salt Lake City	4.5317	....	6.1718	5.5317	....	4.9817	4.9817	4.8817	5.90	....	....	....	....

MILL EXTRAS FOR NATIONAL EMERGENCY STEELS

Designation	Basic Open-Hearth		Electric Furnace		Designation	Basic Open-Hearth		Electric Furnace	
	Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs		Bars and Bar-Strip	Billets, Blooms, and Slabs	Bars and Bar-Strip	Billets, Blooms, and Slabs
NE 1330	0.10¢	$2.00	....	.....	NE 9415	0.75¢	$15.00	$1.25	$25.00
NE 1335	0.10	2.00	....	.....	NE 9417	0.75	15.00	1.25	25.00
NE 1340	0.10	2.00	....	.....	NE 9420	0.75	15.00	1.25	25.00
NE 1345	0.10	2.00	....	.....	NE 9422	0.75	15.00	1.25	25.00
NE 1350	0.10	2.00	....	.....	NE 9425	0.75	15.00	1.25	25.00
					NE 9427	0.75	15.00	1.25	25.00
NE 8612	0.65¢	$13.00	$1.15	$23.00	NE 9430	0.75	15.00	1.25	25.00
NE 8615	0.65	13.00	1.15	23.00	NE 9432	0.75	15.00	1.25	25.00
NE 8617	0.65	13.00	1.15	23.00	NE 9435	0.75	15.00	1.25	25.00
NE 8620	0.65	13.00	1.15	23.00	NE 9437	0.75	15.00	1.25	25.00
NE 8622	0.65	13.00	1.15	23.00	NE 9440	0.75	15.00	1.25	25.00
NE 8625	0.65	13.00	1.15	23.00	NE 9442	0.80	16.00	1.30	26.00
NE 8627	0.65	13.00	1.15	23.00	NE 9445	0.80	16.00	1.30	26.00
NE 8630	0.65	13.00	1.15	23.00	NE 9447	0.80	16.00	1.30	26.00
NE 8632	0.65	13.00	1.15	23.00	NE 9450	0.80	16.00	1.30	26.00
NE 8635	0.65	13.00	1.15	23.00					
NE 8637	0.65	13.00	1.15	23.00	NE 9722	0.65¢	$13.00	$1.15	$23.00
NE 8640	0.65	13.00	1.15	23.00	NE 9727	0.65	13.00	1.15	23.00
NE 8642	0.65	13.00	1.15	23.00	NE 9732	0.65	13.00	1.15	23.00
NE 8645	0.65	13.00	1.15	23.00	NE 9737	0.65	13.00	1.15	23.00
NE 8647	0.65	13.00	1.15	23.00	NE 9742	0.65	13.00	1.15	23.00
NE 8650	0.65	13.00	1.15	23.00	NE 9745	0.65	13.00	1.15	23.00
					NE 9747	0.65	13.00	1.15	23.00
NE 8712	0.70¢	$14.00	$1.20	$24.00	NE 9750	0.65	13.00	1.15	23.00
NE 8715	0.70	14.00	1.20	24.00	NE 9763	0.65	13.00	1.15	23.00
NE 8717	0.70	14.00	1.20	24.00	NE 9768	0.65	13.00	1.15	23.00
NE 8720	0.70	14.00	1.20	24.00					
NE 8722	0.70	14.00	1.20	24.00	NE 9830	$1.30	$26.00	$1.80	$36.00
NE 8725	0.70	14.00	1.20	24.00	NE 9832	1.30	26.00	1.80	36.00
NE 8727	0.70	14.00	1.20	24.00	NE 9935	1.30	26.00	1.80	36.00
NE 8730	0.70	14.00	1.20	24.00	NE 9837	1.30	26.00	1.80	36.00
NE 8732	0.70	14.00	1.20	24.00	NE 9840	1.30	26.00	1.80	36.00
NE 8735	0.70	14.00	1.20	24.00	NE 9842	1.30	26.00	1.80	36.00
NE 8737	0.70	14.00	1.20	24.00	NE 9845	1.30	26.00	1.80	36.00
NE 8740	0.70	14.00	1.20	24.00	NE 9847	1.30	26.00	1.80	36.00
NE 8742	0.70	14.00	1.20	24.00	NE 9850	1.30	26.00	1.80	36.00
NE 8745	0.70	14.00	1.20	24.00					
NE 8747	0.70	14.00	1.20	24.00	NE 9912	$1.20	$24.00	$1.55	$31.00
NE 8750	0.70	14.00	1.20	24.00	NE 9915	1.20	24.00	1.55	31.00
					NE 9917	1.20	24.00	1.55	31.00
NE 9255	0.40¢	$8.00	....	.....	NE 9920	1.20	24.00	1.55	31.00
NE 9260	0.40	8.00	....	.....	NE 9922	1.20	24.00	1.55	31.00
NE 9261	0.65	13.00	....	.....	NE 9925	1.20	24.00	1.55	31.00
NE 9262	0.65	13.00	....	.....					
					NE 52100A	....	.....	$2.60	$52.00
					NE 52100B	....	.....	2.60	52.00
					NE 52100C	....	.....	2.60	52.00

Note 1: The ranges shown are restricted to sizes 100 sq. in. or less or equivalent cross-sectional area 18 in. wide or under, with a maximum individual piece weight of 7000 lb. irrespective of size. **Note 2:** For steels ordered to such ranges, below the size and weight restriction, the average of all the chemical checks must be within the limits specified subject to check analysis variations given in Table 4, Section 10, A.I.S.I. Steel Products Manual. **Note 3:** When acid open-hearth is specified and acceptable, add to basic open-hearth alloy differential 0.25c. per lb. for bars and bar strip and $5 per gross ton for billets, blooms and slabs. **Note 4:** The extras shown are in addition to the base price of $2.70 for 100 lb. on finished products and $54 per gross ton on semi-finished steel, major basing points, and are in cents per pound when applicabale to bars and bar-strip, and in dollars per gross ton when applicable to billets, blooms and slabs. The full extra applicable over the base price is the total of all extras indicated by the specific requirements of the order. The higher extra shall be charged for any size falling between two published extras.

BASE QUANTITIES

Standard unless otherwise keyed on prices.

HOT ROLLED: Sheets, strip, plates, shapes and bars, 400 to 1999 lb.

COLD ROLLED: Sheets, 400 to 1499 lb.; strip, extras on all quantities; bars, 1500 lb. base; NE alloy bars, 1000 to 39,999 lb.

EXCEPTIONS: (1) 150 to 499 lb. (2) 150 to 1499 lb. (3) 400 to 1499 lb. (4) 450 to 1499 lb. (5) 500 to 1499 lb. (6) 0 to 1999 lb. (7) 400 to 1999 lb. (8) 1000 to 1999 lb. (9) 450 to 3749 lb. (10) 400 to 3999 lb. (11) 300 to 4999 lb. (12) 300 to 10,000 lb. (13) 400 to 14,999 lb. (14) 400 lb. and over. (15) 1000 lb. and over. (16) 1500 lb. and over. (17) 2000 lb. and over. (18) 3500 lb. and over.

(a) Philadelphia: Galvanized sheet, 25 or more bundles.

Extra for size, quality, etc., apply on above quotations.

*Add 0.271c. for sizes not rolled in Birmingham.

**City of Philadelphia only. Applicable freight rates must be added to basing point prices to obtain delivered price to other localities in metropolitan area.

LAKE SUPERIOR ORES

(51.50% *Fe, Natural Content, Delivered Lower Lake Ports**)

	Per Gross Ton
Old range, bessemer, 51.50	$4.75
Old range, non-bessemer, 51.50	4.60
Mesaba, bessemer, 51.50	4.60
Mesaba, non-bessemer, 51.50	4.45
High phosphorus, 51.50	4.35

*Adjustments are made to indicate prices based on variance of Fe content of ores as analyzed on a dry basis by independent laboratories.

FLUORSPAR

Maximum price f.o.b. consumer's plant, $30 per short ton plus either (1) rail freight from producer to consumer, or (2) rail freight from Rosiclare, Ill., to consumer, whichever is lower.

Exception

When the WPB Steel Division certifies in writing the consumer's need for one of the higher grades of metallurgical fluorspar specified in the table below the price shall be taken from the table plus items (1 and 2) from paragraph above.

Effective CaF₂ Content:	*Base price per short ton*
70% or more	$33.00
65% but less than 70%	32.00
60% but less than 65%	31.00
Less than 60%	30.00

PRICES

SEMI-FINISHED STEEL

Ingots, Carbon, Rerolling

Base per gross ton, f.o.b. mill.... $31.00

Exceptions: Phoenix Iron Co. may charge $38.75; Kaiser Co., $43.00 f.o.b. Pacific Coast Ports; Empire Sheet & Tinplate Co., $34.25. Pgh. Steel Co. $33.10.

Ingots, Carbon, Forging

Base per gross ton, f.o.b. Birmingham, Buffalo, Chicago, Cleveland, Gary, Pittsburgh, Youngstown $36.00

Exceptions: Phoenix Iron Co. may charge $43.00; Empire Sheet & Tinplate Co., $39.25, f.o.b. Mansfield, Ohio; West Coast producers, $48.00, f.o.b. Pacific Coast Ports. Pgh. Steel Co. $38.10.

Ingots, Alloy

Base per gross ton, f.o.b. Bethlehem, Buffalo, Canton, Coatesville, Chicago, Massillon, Pittsburgh $45.00

Exceptions: C/L delivered Detroit add $2.00; delivered East Michigan add $3.00. Connors Steel Co. may charge $45.00 f.o.b. Birmingham.

Billets, Blooms and Slabs

Pittsburgh, Chicago, Gary, Cleveland, Youngstown, Buffalo, Birmingham, Sparrows Point (rerolling only). Prices delivered Detroit are $2.00 higher; delivered E. Michigan, $3 higher; f.o.b. Duluth, billets only, $2.00 higher; billets f.o.b. Pacific ports are $12 higher. Provo, $11.20 higher. Delivered prices do not reflect three per cent tax on freight rates.

	Per Gross Ton
Rerolling	$34.00
Forging quality	40.00

For exceptions on semi-finished steel see the footnote on the page of finished steel prices.

Alloy Billets, Blooms, Slabs

Pittsburgh, Chicago, Canton, Massillon, Buffalo, or Bethlehem, per gross ton 54.00

Price delivered Detroit $2.00 higher; E. Michigan $3.00 higher.

Shell Steel

	Per Gross Ton
3 in. to 12 in.	$52.00
12 in. to 18 in.	54.00
18 in. and over	56.00

Basic open hearth shell steel, f.o.b. Pittsburgh, Chicago, Buffalo, Gary, Cleveland, Youngstown and Birmingham.

Prices delivered Detroit are $2.00 higher; E. Michigan, $3 higher.

Price Exception: Follansbee Steel Corp. permitted to sell at $13.00 per gross ton, f.o.b. Toronto, Ohio, above base price of $52.00.

Note: The above base prices apply on lots of 1000 tons of a size and section to which are to be added extras for chemical requirements, cutting, or quantity.

Sheet Bars

Pittsburgh, Chicago, Cleveland, Youngstown, Buffalo, Canton, Sparrows Point.

	Per Gross Ton
Open hearth or bessemer	$34.00

Skelp

Pittsburgh, Chicago, Youngstown, Coatesville, Pa., Sparrows Point, Md.

	Per Lb.
Grooved, universal and sheared	1.90c.

Wire Rods

(No. 5 to 9/32 in.)

	Per Lb.
Pittsburgh, Chicago, Cleveland	2.00c.
Worcester, Mass.	2.10c.
Birmingham	2.00c.
San Francisco	2.50c.
Galveston	2.25c.

9/32 in. to 47/64 in., 0.15c. a lb. higher. Quantity extras apply.

TOOL STEEL

(F.o.b. Pittsburgh, Bethlehem, Syracuse)

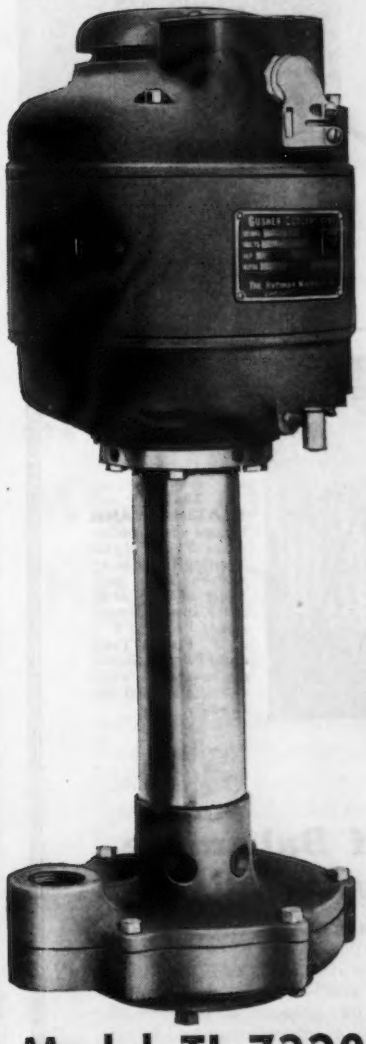
	Base per lb.
High speed	67c.
Straight molybdenum	54c.
Tungsten-molybdenum	57½c.
High-carbon-chromium	43c.
Oil hardening	24c.
Special carbon	22c.
Extra carbon	18c.
Regular carbon	14c.

Warehouse prices east of Mississippi are 1c. a lb. higher; west of Mississippi 1c. higher.

accept no substitute!

ASSURE YOURSELF OF GETTING THE ORIGINAL BY SPECIFYING

GUSHER
COOLANT PUMPS



Universally accepted by leading machine-tool designers and builders, GUSHER Pumps have many original features.

Simplicity and sturdiness of construction, with a minimum of wearing parts, assure long life and full-time, hard-usage service. Multiplicity of types and sizes, producing anything from a tiny trickle to 200 gallons per minute, gives you your choice of a Gusher model and type for your special needs.

Grit and chips in the coolant pass through a Gusher without the least harm, as the Gusher has no packing nuts, no metal-to-metal contacts, no relief valves, and no auxiliary strainers. . . . For the genuine article, remember to *specify* Gusher!

Model TL-7320

See Section 2 of new catalog, indexed for quick reference.

Write for catalog

Gusher Pumps—Patented and Patents Pending

THE RUTHMAN MACHINERY CO.
1821 READING ROAD CINCINNATI 2, OHIO
THE "GUSHER"—A MODERN PUMP FOR MODERN MACHINE TOOLS

Best! FOR LIGHT DUTY Speed!

High Speed at Low Cost No. 4B

For tool room, stock room, or maintenance shop, this 6" x 6" capacity hack saw is superior to anything in its price class. Embodies similar design principles and features of MARVEL Heavy Duty production saws. Cuts a 2" standard pipe in 30 seconds—a 5" round piece of machine steel in 8 minutes!

MARVEL SAWS

2-Speed and 4-Speed

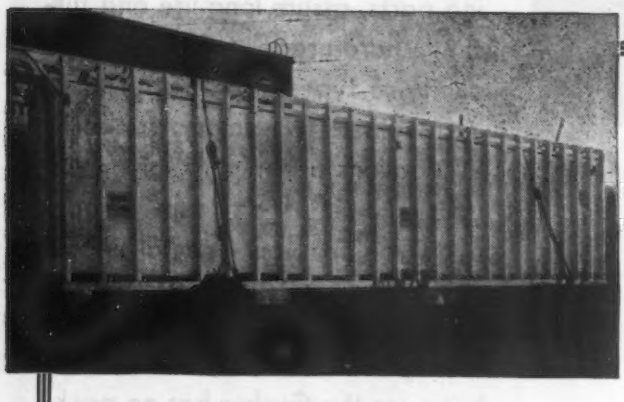
For applications where materials of different hardnesses and alloy characteristics are to be cut, MARVEL 4B is available in 2-Speed and 4-Speed models. Built-in work tracks for holding outer end of bars are also available for all models.

Complete Range of Metal Sawing Machines

Being the largest exclusive manufacturer of metal sawing machines and blades, both hack saw and band saw type, we have the correct answer to your cut-off problems. Each MARVEL model has a distinct application, so write us and we will send our catalog, price, and recommendation for the saw to fill your requirements most efficiently. MARVEL sawing engineers are also available to discuss and analyze your cut-off work. (Without obligation of course.)

ARMSTRONG-BLUM MFG. CO.

5700 W. Bloomingdale Ave., Chicago 39, Illinois, U.S.A.



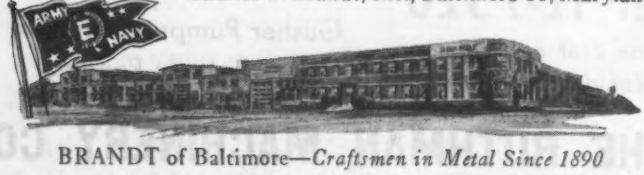
30-TON PLATING TANK for use with Continuous Electrolytic Tinning Lines in an eastern steel mill. Built of ½" steel plate, inside dimensions: 4'4" x 11'6" x 51'0". Plating Tank and Tinning Lines engineered, fabricated, installed by Brandt.

Heavy Plate or Light Sheet—

Call BRANDT of Baltimore

for Precision in Heavy Plate and Sheet Steel Work

Here is an 8½ acre plant . . . with the most modern equipment for shearing, rolling, forming, welding and completely fabricating ferrous, non-ferrous and alloy metals to your specifications . . . from the lightest gauge up to and including 1¼" mild steel or ¾" armor plate. Extensive war contracts necessarily limit our present acceptance of new business for immediate delivery. For information, address: Charles T. Brandt, Inc., Baltimore-30, Maryland.



BRANDT of Baltimore—*Craftsmen in Metal Since 1890*

PRICES

WELDED PIPE AND TUBING

Base Discounts, f.o.b. Pittsburgh District and Lorain, Ohio, Mills

(F.o.b. Pittsburgh only on wrought pipe)
Base Price—$200.00 per Net Ton

	Black	Galv.
Steel (Butt Weld)		
½ in.	63½	51
¾ in.	66½	55
1 to 3 in.	68½	57½
Wrought Iron (Butt Weld)		
½ in.	24	3½
¾ in.	30	10
1 and 1¼ in.	34	16
1½ in.	38	18½
2 in.	37½	18
Steel (Lap Weld)		
2 in.	61	49½
2½ and 3 in.	64	52½
3½ to 6 in.	66	54½
Wrought Iron (Lap Weld)		
2 in.	30½	12
2½ to 3½ in.	31½	14½
4 in.	33½	18
4½ to 8 in.	32½	17
Steel (Butt, extra strong, plain ends)		
½ in.	61½	50½
¾ in.	65½	54½
1 to 3 in.	67	57
Wrought Iron (Same as Above)		
½ in.	25	6
¾ in.	31	12
1 to 2 in.	38	19½
Steel (Lap, extra strong, plain ends)		
2 in.	59	48½
2½ and 3 in.	63	52½
3½ to 6 in.	66½	56
Wrought Iron (Same as Above)		
2 in.	33½	15½
2½ to 4 in.	39	22½
4½ to 6 in.	37½	21

On butt weld and lap weld steel pipe jobbers are granted a discount of 5%. On less-than-carload shipments prices are determined by adding 25 and 30% and the carload freight rate to the base card.

F.o.b. Gary prices are two points lower discount or $4 a ton higher than Pittsburgh or Lorain on lap weld and one point lower discount, or $2 a ton higher on all butt weld.

CAST IRON WATER PIPE

	Per Net Ton
6-in. and larger, del'd Chicago	$54.80
6-in. and larger, del'd New York	52.30
6-in. and larger, Birmingham	46.00
6-in. and larger f.o.b. cars, San Francisco or Los Angeles	69.40
6-in. and larger f.o.b. cars, Seattle	71.30

Class "A" and gas pipe, $3 extra; 4-in. pipe is $3 a ton above 6-in. Prices shown are for lots of less than 200 tons. For 200 tons or over, 6-in. and larger are $45 at Birmingham and $53.80 delivered Chicago, $59.40 at San Francisco and Los Angeles, and $70.20 at Seattle. Delivered prices do not reflect new 3 per cent tax on freight rates.

BOILER TUBES

Seamless Steel and Lap Weld Commercial Boiler Tubes and Locomotive Tubes, Minimum Wall. Net base prices per 100 ft. f.o.b. Pittsburgh, in carload lots.

	Seamless Cold Drawn	*Seamless Hot Rolled*	*Lap Weld, Hot Rolled*
2 in. o.d. 13 B.W.G.	15.03	13.04	12.38
2½ in. o.d. 12 B.W.G.	20.21	17.54	16.53
3 in. o.d. 12 B.W.G.	22.48	19.50	18.35
3½ in. o.d. 11 B.W.G.	28.37	24.62	23.15
4 in. o.d. 10 B.W.G.	35.20	30.54	28.66

(Extras for less carload quantities)

40,000 lb. or ft., and over	Base
30,000 lb. or ft. to 39,999 lb. or ft.	5%
20,000 lb. or ft. to 29,999 lb. or ft.	10%
10,000 lb. or ft. to 19,999 lb. or ft.	20%
5,000 lb. or ft. to 9,999 lb. or ft.	30%
2,000 lb. or ft. to 4,999 lb. or ft.	45%
Under 2,000 lb. or ft.	65%

PRICES

WIRE PRODUCTS

To the trade, f.o.b. Pittsburgh, Chicago, Cleveland, Birmingham, Duluth

	Basing Points Named	*Pacific Coast Basing Points†*
	Base per Keg	
Standard wire nails	$2.55	$3.05
Coated nails	2.55	3.05
Cut nails, carloads	3.35	....
	Base per 100 Lb.	
Annealed fence wire	$3.05	$3.55
Annealed galv. fence wire	3.40	3.90
	Base Column	
Woven wire fence*	$0.67	$0.85
Fence posts, carloads	.69	.86
Single loop bale ties	.59	.84
Galvanized barbed wire**	.70	.80
Twisted barbless wire	.70	....

*15½ gage and heavier. **On 80-rod spools in carload quantities.
†Prices subject to switching or transportation charges.

BOLTS, NUTS, RIVETS, SET SCREWS

Bolts and Nuts

(F.o.b. Pittsburgh, Cleveland, Birmingham or Chicago)

Machine and Carriage Bolts:

Base discount less case lots

	Per Cent Off List
½ in. & smaller x 6 in. & shorter	65½
9/16 & ⅝ in. x 6 in. & shorter	63½
¾ to 1 in. x 6 in. & shorter	61
1⅛ in. and larger, all lengths	59
All diameters over 6 in. long	59
Lag, all sizes	62
Plow bolts	65

Nuts, Cold Punched or Hot Pressed:
(Hexagon or Square)

½ in. and smaller	62
9/16 to 1 in. inclusive	59
1⅛ to 1½ in. inclusive	57
1⅝ in. and larger	56

On above bolts and nuts, excepting plow bolts, additional allowance of 10 per cent for full container quantities. There is an additional 5 per cent allowance for carload shipments.

Semi-Fin. Hexagon Nuts	U.S.S.	S.A.E.
Base discount less keg lots		
7/16 in. and smaller	..	64
½ in. and smaller	62	..
½ in. through 1 in.	..	60
9/16 in. to 1 in.	59	..
1⅛ in. through 1½ in.	57	58
1⅝ in. and larger	56	..

In full keg lots, 10 per cent additional discount.

Stove Bolts

	Consumer
Packages, nuts loose	71 and 10
In packages, with nuts attached	71
In bulk	80

On stove bolts freight allowed up to 65c per 100 lb. based on Cleveland, Chicago, New York on lots of 200 lb. or over.

Large Rivets
(½ in. and larger)

	Base per 100 lb.
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	$3.75

Small Rivets
(7/16 in. and smaller)

	Per Cent Off List
F.o.b. Pittsburgh, Cleveland, Chicago, Birmingham	65 and 5

Cap and Set Screws

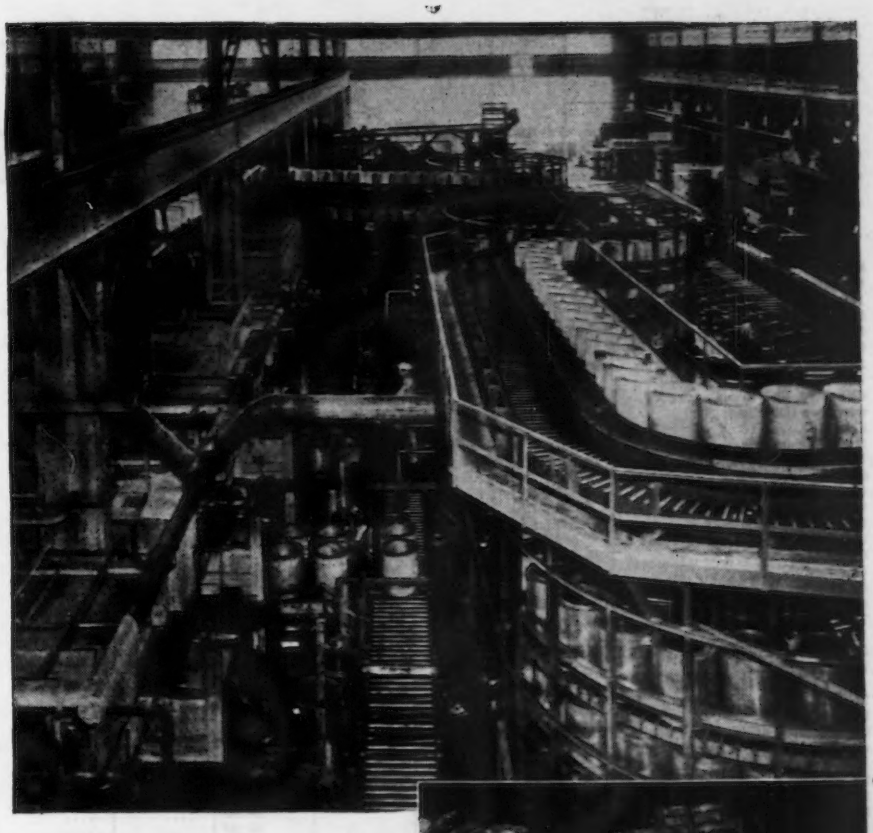
	Consumer Per Cent Off List
Upset full fin. hexagon head cap screws, coarse or fine thread, up to and incl. 1 in. x 6 in.	64
Upset set screws, cup and oval points	71
Milled studs	46
Flat head cap screws, listed sizes	36
Fillister head cap, listed sizes	51

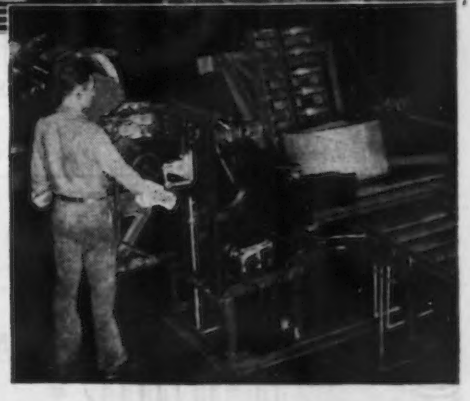
Freight allowed up to 65c per 100 lb. based on Cleveland, Chicago or New York on lots of 200 lb. or over.

ROOFING TERNE PLATE

(F.o.b. Pittsburgh, 112 Sheets)

	20x14 in.	20x28 in.
8-lb. coating I.C.	$6.00	$12.00
15-lb. coating I.C.	7.00	14.00
20-lb. coating I.C.	7.50	15.00





PUT MATHEWS METHODS INTO YOUR POST-WAR PLANS

The need for special devices in conveying systems, increased during these war years of fast and tremendous production, has found Mathews Engineering ready and eager for the job. Frequently, the conveying problems have been entirely new. Always, they have been different in some respects from even the most similar jobs in the past. The conveyers were needed quickly and the need was great. To meet this need, Mathews Engineers and production personnel have hammered away steadily, meeting these problems as they came, and solving them. As a result of this activity — these new problems — these special devices which were developed — many years of experience have been packed into a short while. That is why Mathews methods are up to the minute. This experience is available, through the Mathews Field Engineer, in all principal cities in the United States and Canada.

Mathews Conveyer Company

ELLWOOD CITY, PENNSYLVANIA

PIG IRON

All prices set in bold face type are maxima established by OPA on June 24, 1941. Other domestic prices (in italics) are delivered quotations per gross ton computed on the basis of the official maxima. Delivered prices do not reflect 3 per cent tax on freight rates.

	No. 2 Foundry	Basic	Bessemer	Malleable	Low Phos-phorus	Charcoal
Boston	*$25.50*	*$25.00*	*$26.50*	*$26.00*	.....	.....
Brooklyn	*27.50*	*27.00*	.....	*28.00*	.....	.....
Jersey City	*26.53*	*26.03*	*27.53*	*27.03*	.....	.....
Philadelphia (4)	*25.84*	*25.34*	*26.84*	*26.34*	*$30.74*	.....
Bethlehem, Pa.	25.00	24.50	26.00	25.50	.....	.....
Everett, Mass.	25.00	24.50	26.00	25.50	.....	.....
Swedeland, Pa.	25.00	24.50	26.00	25.50	.....	.....
Steelton, Pa.	.....	24.50	.....	.....	29.50	.....
Birdsboro, Pa. (3)	25.00	24.50	26.00	25.50	29.50	.....
Sparrows Point, Md.	25.00	24.50	.....	.....	.....	.....
Erie, Pa.	24.00	23.50	25.00	24.50	.....	.....
Neville Island, Pa.	24.00	23.50	24.50	24.00	.....	.....
Sharpsville, Pa. (1)	24.00	23.50	24.50	24.00	.....	.....
Buffalo	24.00	23.00	25.00	24.50	29.50	.....
Cincinnati, Ohio	*25.11*	*24.61*	.....	*25.11*	.....	.....
Canton, Ohio	*25.39*	*24.89*	*25.89*	*25.39*	*32.89*	.....
Mansfield, Ohio	*25.94*	*25.44*	*26.44*	*25.94*	*32.86*	.....
St. Louis	*24.50*	*24.50*	.....	.....	.....	.....
Chicago	24.00	23.50	24.50	24.00	*35.46*	.....*$37.34*
Granite City, Ill.	24.00	23.50	24.50	24.00	.....	.....
Cleveland	24.00	23.50	24.50	24.00	*32.42*	.....
Hamilton, Ohio	24.00	23.50	.....	24.00	.....	.....
Toledo	24.00	23.50	24.50	24.00	.....	.....
Youngstown	24.00	23.50	24.50	24.00	*32.42*	.....
Detroit	24.00	23.50	24.50	24.00	.....	.....
Lake Superior fc.	.....	.....	.....	.....	.....	34.00
Lyles, Tenn. fc. (2)	.....	.....	.....	.....	.....	33.00
St. Paul	*26.63*	*26.13*	*27.13*	*26.63*	*39.80*	.....
Duluth	24.50	24.00	25.00	24.50	....	.....
Birmingham	20.38	19.00	25.00	.....	.....	.....
Los Angeles	*26.95*	.....	.....	.....	.....	.....
San Francisco	*26.95*	.....	.....	.....	.....	.....
Seattle	*26.95*	.....	.....	.....	.....	.....
Provo, Utah	22.00	21.50	.....	.....	.....	.....
Montreal	*27.50*	*27.50*	.....	*28.00*	.....	.....
Toronto	*25.50*	*25.50*	.....	*26.00*	.....	.....

GRAY FORGE IRON: Valley or Pittsburgh furnace $23.50

(1) Pittsburgh Coke & Iron Co. (Sharpsville, Pa., furnace only) and the Struthers Iron and Steel Co., Struthers, Ohio, may charge 50c. a ton in excess of basing point prices for No. 2 foundry, basic, bessemer and malleable. Struthers Iron and Steel Co. may add another $1.00 per gross ton for iron from Struthers, Ohio, plant.

(2) Price shown is for low-phosphorous iron; high phosphorous sells for $28.50 at the furnace.

(3) E. & G. Brooke Co. Birdsboro, Pa., permitted to charge $1.00 per ton extra.

(4) Pittsburgh Ferromanganese Co. (Chester furnace only) may charge $2.25 a ton over maximum basing point prices.

Basing point prices are subject to switching charges; Silicon differentials (not to exceed 50c. a ton for each 0.25 per cent silicon content in excess of base grade which is 1.75 to 2.25 per cent); Phosphorus differentials, a reduction of 38c. per ton for phosphorus content of 0.70 per cent and over; Manganese differentials, a charge not to exceed 50c. per ton for each 0.50 per cent manganese content in excess of 1.00 per cent. Effective March 3, 1943, $2 per ton extra may be charged for 0.5 to 0.75 per cent nickel content and $1 per ton extra for each additional 0.25 per cent nickel.

"100%" ... that's what many people call the springs we make ... including a certain branch of our military forces. Sometimes we may drop to 99% ... or possibly a little less ... but then we're only 99 years old ... and we've got a lot to learn ... but we'll keep trying because we want to be "Everybody's Spring Dept."

DUNBAR
BROTHERS CO.
DIV. OF ASSOCIATED SPRING CORP.
BRISTOL, CONN.

SPRINGS · WIRE FORMS · SMALL STAMPINGS

METAL POWDERS

Prices are based on current market prices of ingots plus a fixed figure. F.o.b. shipping point, c. per lb., ton lots.

Copper, electrolytic, 150 and 200 mesh	21⅛ to 23½c.
Copper, reduced, 150 and 200 mesh	20½ to 25½c.
Iron, commercial, 100 and 200 mesh, 96 + % Fe	13½ to 15c.
Iron, crushed, 200 mesh and finer, 90 + % Fe, carload lots	4c.
Iron, hydrogen reduced, 300 mesh and finer, 98½ + % Fe, drum lots	63c.
Iron, electrolytic, unannealed, 300 mesh and coarser, 99 + % Fe	30 to 33c.
Iron, electrolytic, annealed minus 100 mesh, 99 + % Fe	42c.
Iron, carbonyl, 300 mesh and finer, 98-99.8 + % Fe	90c.
Aluminum, 100 and 200 mesh	*23 to 27c.
Antimony, 100 mesh	20.6c.
Cadmium, 100 mesh	$1
Chromium, 150 mesh	$1.03
Lead, 100, 200 & 300 mesh, 11½ to 12½c.	
Manganese, 150 mesh	51c.
Nickel, 150 mesh	51½c.
Solder powder, 100 mesh, 8½c. plus metal	
Tin, 100 mesh	53¾c.
Tungsten metal powder, 98%-99%, any quantity, per lb.	$2.60
Molybdenum powder, 99%, in 200-lb. kegs, f.o.b. York, Pa., per lb.	$2.60
Under 100 lb.	$3.00

*Freight allowed east of Mississippi.

COKE

	Net Ton
Furnace, beehive (f.o.b. oven)	
Connellsville, Pa.	$7.00*
Foundry, beehive (f.o.b. oven)	
Fayette Co., W. Va.	8.10
Connellsville, Pa.	8.35
Foundry, By-Product	
Chicago, del'd	13.38
Chicago, f.o.b.	12.60
New England, del'd	14.25
Kearny, N. J., f.o.b.	12.65
Philadelphia, del'd	12.88
Buffalo, del'd	13.00
Portsmouth, Ohio, f.o.b.	11.10
Painesville, Ohio, f.o.b.	11.75
Erie, del'd	12.75
Cleveland, del'd	12.80
Cincinnati, del'd	12.85
St. Louis, del'd	13.85
Birmingham, del'd	10.50

*Hand drawn ovens using trucked coal permitted to charge $7.75 per ton plus transportation charges. **Mo., Ala., and Tenn. producers—$13.35.

PRICES

REFRACTORIES
(F.o.b. Works)

Fire Clay Brick	*Per 1000*
Super-duty brick, St. Louis	$64.60
First quality, Pa., Md., Ky., Mo., Ill.	51.30
First quality, New Jersey	56.00
Sec. quality, Pa., Md., Ky., Mo., Ill.	46.55
Second quality, New Jersey	51.00
No. 1, Ohio	43.00
Ground fire clay, net ton	7.60
Silica Brick	
Pennsylvania and Birmingham	$51.30
Chicago District	58.90
Silica cement, net ton (Eastern)	9.00
Chrome Brick	*Per Net Ton*
Standard chemically bonded, Balt., Plymouth Meeting, Chester	$54.00
Magnesite Brick	
Standard, Balt. and Chester	$76.00
Chemically bonded, Baltimore	65.00
Grain Magnesite	
Domestic, f.o.b. Balt. and Chester in sacks (carloads)	$43.48
Domestic, f.o.b. Chewelah, Wash. (in bulk)	22.00

RAILS, TRACK SUPPLIES
(F.o.b. Mill)

Standard rails, heavier than 60 lb., No. 1 O.H., gross ton	$40.00
Angle splice bars, 100 lb.	2.70
(F.o.b. Basing Points)	*Per Gross Ton*
Light rails (from billets)	$40.00
Light rails (from rail steel)	39.00
	Base per Lb.
Cut spikes	3.00c.
Screw spikes	5.15c.
Tie plates, steel	2.15c.
Tie plates, Pacific Coast	2.30c.
Track bolts	4.75c.
Track bolts, heat treated, to railroads	5.00c.
Track bolts, jobbers discount	63-5

Basing points, light rails, Pittsburgh, Chicago, Birmingham; cut spikes and tie plates—Pittsburgh, Chicago, Portsmouth, Ohio, Weirton, W. Va., St. Louis, Kansas City, Minnequa, Colo., Birmingham and Pacific Coast ports; tie plates alone—Steelton, Pa., Buffalo. Cut spikes alone—Youngstown, Lebanon, Pa., Richmond, Oregon and Washington ports, add 25c.

CORROSION AND HEAT-RESISTING STEEL
(Per lb. base price, f.o.b. Pittsburgh)

Chromium-Nickel Alloys

	No. 304	No. 302
Forging billets	21.25c.	20.40c.
Bars	25.00c.	24.00c.
Plates	29.00c.	27.00c.
Structural shapes	25.00c.	24.00c.
Sheets	36.00c.	34.00c.
Hot rolled strip	23.50c.	21.50c.
Cold rolled strip	30.00c.	28.00c.
Drawn wire	25.00c.	24.00c.

Straight-Chromium Alloys

	No. 410	No. 430	No. 442	No. 446
F.Billets	15.725c.	16.15c.	19.125c.	23.375c.
Bars	18.50c.	19.00c.	22.50c.	27.50c.
Plates	21.50c.	22.00c.	25.50c.	30.50c.
Sheets	26.50c.	29.00c.	32.50c.	36.50c.
Hot strip	17.00c.	17.50c.	24.00c.	35.00c.
Cold strip	22.00c.	22.50c.	32.00c.	52.00c.

Chromium-Nickel Clad Steel (20%)

	No. 304
Plates	18.00c.*
Sheets	19.00c.

*Includes annealing and pickling.

ELECTRICAL SHEETS
(Base, f.o.b. Pittsburgh)

	Per Lb.
Field grade	3.20c.
Armature	3.55c.
Electrical	4.05c.
Motor	4.95c.
Dynamo	5.65c.
Transformer 72	6.15c.
Transformer 65	7.15c.
Transformer 58	7.65c.
Transformer 52	8.45c.

F.o.b. Granite City, add 10c. per 100 lb. on field grade to and including dynamo. Pacific ports add 75c. per 100 lb. on all grades.

FOR ALL TYPES of INDUSTRIAL FURNACES

AIROVENT

. . . a venturi inspirating type gas burner with a wide range of furnace applications

This gas burner is of an improved design that will produce a flame of any desired degree of luminosity, having the highest heat liberation, with only a small amount of excess air.

Has these features: Low turndown without the flame flashing back; Maximum primary air inspirated; Close adjustment of the primary air-gas ratio; Gas orifice easily removed or changed.

Available in nine sizes, 1 to 8 inch, with rated capacities up to 11,000 cu. ft. per hour, per burner. Straight or angle mounting.

NATIONAL AIROIL FUEL OIL - GAS BURNERS

Steam Atomizing Oil Burners—Mechanical Pressure Atomizing Oil Burners—Low Air Pressure Oil Burners—Motor-driven Rotary Oil Burners — Industrial Gas Burners—Combination Gas and Oil Burners—Fuel Oil Pumping Units—Fuel Oil Heaters—Fuel Oil Strainers and other accessories.

Another National Airoil Burner

Cross Section of Type SA Oil Burner

NATIONAL AIROIL BURNER COMPANY, INCORPORATED

1271 East Sedgley Ave., Philadelphia 34, Pa.

ESTABLISHED 1912 *INCORPORATED 1917*

BELLEVUE FURNACES

are designed for the job.

In the construction of Bellevue Furnaces, painstaking consideration of the job to be done comes first. Every factor must be evaluated, every condition studied. Only then do Bellevue engineers attempt design and recommendation of furnace type.

The soundness of that policy is being demonstrated in plant after plant. Hundreds of executives in scores of varied companies have proved, to their own satisfaction, the efficiency, speed, high production level and operating economies of Bellevues that were "designed" for the job.

You, too, will find Bellevue experience and facilities a profitable investment for your own furnace needs.

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PRECISION WORK ON SMALL PARTS

(up to 20 lbs.)

Induction heat-treating (30 KW)
External Grinding (up to 10" x 36")
Internal Grinding
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Milling—vertical, horizontal, contour
Duplicating
Automatic lathe work
Etc.

For list of equipment, pictures and other information concerning plant write

GENERAL REFINERIES, INC.

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General Purpose
Dredging and Hard Digging
Dragline
Material Handlers
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Ore Handling
Coal and Coke
4-Rope
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THE COMPLETE LINE

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Above types built in weights and capacities to suit your crane and job requirements.

ERIE STEEL CONSTRUCTION CO.

ERIE, PENNSYLVANIA

Aggre Meters • Buckets • Concrete Plants • Traveling Cranes

PRICES

Ferromanganese

78-82% Mn, maximum contract base price per gross ton, lump size, f.o.b. car at Baltimore, Bethlehem, Philadelphia, New York, Birmingham, Rockdale, Rockwood, Tenn.

Carload lots (bulk)	$135.00
Carload lots (packed)	141.00
Less ton lots (packed)	148.50

Premium, $1.70 for each 1% above 82% Mn; penalty, $1.70 for each 1% below 78%.

Manganese Metal

Contract basis, lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Spot sales add 2c. per lb.

96-98% Mn, .2% max. C, 1% max. Si, 2% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

95-97% Mn, .2% max. C, 1.5% max. Si, 2.5% max. Fe.

Carload, bulk	34c.
L.c.l. lots	35c.

Spiegeleisen

Maximum base, contract prices, per gross ton, lump, f.o.b. Palmerton, Pa.

	16-19% Mn 3% max. Si	19-21% Mn 3% max. Si
Carloads	$35.00	$36.00
Less ton	47.50	48.50

Electric Ferrosilicon

OPA maximum base price cents per lb. contained Si, lump size in carlots, f.o.b. shipping point with freight allowed to destination.

	Eastern Zone	Central Zone	Western Zone
50% Si	6.65c.	7.10c.	7.25c.
75% Si	8.05c.	8.20c.	8.75c.
80-90% Si	8.90c.	9.05c.	9.55c.
90-95% Si	11.05c.	11.20c.	11.65c.

Spot sales add: .45c. per lb. for 50% Si, .3c. per lb. or 75% Si .25c. per lb. for 80-90% and 90-95% Si.

Silvery Iron

(C/L, Per Gross Ton, base 6.00 to 6.50 Si)

F.o.b. Jackson, Ohio	$29.50*
Buffalo	30.75*

For each additional 0.50% silicon add $1 a ton. For each 0.50% manganese over 1% add 50c. a ton. Add $1 a ton for 0.75% phosphorous or over.

*OPA price established 6-24-41.

Bessemer Ferrosilicon

Prices are $1 a ton above silvery iron quotations of comparable analysis.

Silicon Metal

OPA maximum base price per lb. of contained Si, lump size, f.o.b. shipping point with freight allowed to destination, for l.c.l. above 2000 lb., packed. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
96% Si, 2% Fe.	13.10c.	13.55c.	16.50c.
97% Si, 1% Fe.	13.45c.	13.90c.	16.80c.

Ferrosilicon Briquets

OPA maximum base price per lb. of briquet, bulk, f.o.b. shipping point with freight allowed to destination. Approximately 40% Si. Add .25c. for spot sales.

	Eastern Zone	Central Zone	Western Zone
Carload, bulk	3.35c.	3.50c.	3.65c.
2000 lb.-carload	3.8c.	4.2c.	4.25c.

Silicomanganese

Contract basis lump size, per lb. of metal, f.o.b. shipping point with freight allowed. Add .25c. for spot sales. 65-70% Mn, 17-20% Si, 1.5% max. C.

Carload, bulk	6.05c.
2000 lb. to carload	6.70c.
Under 2000 lb.	6.90c.
Briquets, contract, basis carlots, bulk freight allowed, per lb.	5.80c.
2000 lb. to carload	6.30c.
Less ton lots	6.55c.

Ferrochrome

(65-72% Cr, 2% max. Si)

OPA maximum base contract prices per lb. of contained Cr, lump size in carload lots, f.o.b. shipping point, freight allowed to destination. Add .25c. per lb. contained Cr for spot sales.

	Eastern Zone	Central Zone	Western Zone
0.06% C	23.00c.	23.40c.	24.00c.
0.10% C	22.50c.	22.90c.	23.50c.
0.15% C	22.00c.	22.40c.	23.00c.
0.20% C	21.50c.	21.90c.	22.50c.
0.50% C	21.00c.	21.40c.	22.00c.
1.00% C	20.50c.	20.90c.	21.50c.
2.00% C	19.50c.	19.90c.	21.00c.
66-71% Cr, 4-10% C	13.00c.	13.40c.	14.00c.

Other Ferroalloys

Ferrotungsten, Standard grade, lump or ¼X down, packed, f.o.b. plant at Niagara Falls, New York, Washington, Pa., York, Pa., per lb. contained tungsten, 10,000 lb. or more... $1.90

Ferrovanadium, 35-55%, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. contained Va.
- Open Hearth $2.70
- Crucible $2.80
- Primos $2.90

Cobalt, 97% min., keg packed, contract basis, f.o.b. producer's plant, usual freight allowances, per lb. of cobalt metal..... $1.50

Vanadium pentoxide, 88%-92% V_2O_5 technical grade, contract basis, any quantity, per lb. contained V_2O_5. Spot sales add 5c. per lb. contained V_2O_5..... $1.10

Ferroboron, contract basis, 17.50% min. Bo, f.o.b. producer's plant with usual freight allowances, per lb. of alloy.
- 2000 lb. to carload..... $1.20
- Under 2000 lb..... 1.30

Silcaz No. 3, contract basis, f.o.b. producer's plant with usual freight allowances, per lb. of alloy. (Pending OPA approval)
- Carload lots ..... 25c.
- 2000 lb. to carload..... 26c.

Silvaz No. 3, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy (Pending OPA approval)
- Carload lots ..... 58c.
- 2000 lb. to carload..... 59c.

Grainal, f.o.b. Bridgeville, Pa., freight allowed 50 lb. and over, max. based on rate to St. Louis
- No. 1 ..... 87.5c.
- No. 6 ..... 60c.
- No. 79 ..... 45c.

Bortram, f.o.b. Niagara Falls
- Ton lots, per lb..... 45c.
- Less ton lots, per lb..... 50c.

Ferrocolumbium, 50-60%, contract basis, f.o.b. plant with freight allowances, per lb. contained Cb.
- 2000 lb. lots $2.25
- Under 2000 lb. lots $2.30

Ferrotitanium, 40%-45%, f.o.b. 0.10c. max. Niagara Falls, N. Y., ton lots, per lb. contained Ti.. $1.23
- Less ton lots $1.25

Ferrotitanium, 20%-25%, 0.10 C max., ton lots, per lb. contained titanium $1.35
- Less ton lots $1.40

High-carbon ferrotitanium, 15%-20%, 6%-8% carbon, contract basis, f.o.b. Niagara Falls, N. Y., freight allowed East of Mississippi River, North of Baltimore and St. Louis, per carload $142.50

Ferrophosphorus, 18% electric or blast furnaces, f.o.b. Anniston, Ala., carlots, with $3 unitage freight equalled with Rockdale, Tenn., per gross ton $58.50

Ferrophosphorus, electrolytic 23-26%, carlots, f.o.b. Monsanto (Siglo), Tenn., $3 unitage freight equalized with Nashville, per gross ton $75.00

Ferromolybdenum, 55-75%, f.o.b. Langeloth, Washington, Pa., any quantity, per lb. contained Mo. 95c.

Calcium molybdate, 40%-45%, f.o.b. Langeloth and Washington, Pa., any quantity, per lb. contained Mo. ..... 80c.

Molybdenum oxide briquetes, 48%-52% Mo, f.o.b. Langeloth, Pa., per lb. contained Mo ..... 80c.

Molybdenum oxide, in cans, f.o.b. Langeloth and Washington, Pa., per lb. contained Mo ..... 80c.

Zirconium, 35-40%, contract basis, f.o.b. producer's plant with freight allowances, per lb. of alloy. Add ¼c. for spot sales
- Carload lots ..... 14c.

Zirconium, 12-15%, contract basis, lump f.o.b. plant usual freight allowances, per lb. of alloy
- Carload, bulk ..... 4.6c.

Alsifer (approx. 20% Al, 40% Si and 40% Fe), contract basis, f.o.b. Niagara Falls, carload, bulk ..... 5.75c.
- Ton lots ..... 7.25c.

Simanal (approx. 20% Si, 20% Mn, 20% Al), contract basis, f.o.b. Philo, Ohio, with freight not to exceed St. Louis rate allowed, per lb.
- Car lots ..... 8.75c.
- Ton lots ..... 9.25c.

JOHNSON *High Carbon Wire*

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Round — Half Round — Oval — Square — Flat
Triangular and Special Shapes

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Bright-Coppered — Liquor Finish — Bronze Plated
Tinned — Cadmium — Bright Galvanized
Oil Tempered Round — Flat and Shaped Wires

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WORCESTER 1, MASSACHUSETTS
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With Reading Multiple Gear Chain Hoists heavy loads can be lifted with little effort. Spur gear design and an 80% efficiency of the hoist gives rapid hoisting with relatively little effort.

Brake action is positive, accurate, easy to control and absolutely safe. The brake itself is self-adjusting and takes up its own wear. Long, trouble-free operation is assured by the self-lubricating gearing sealed in oil; anti-friction bearings sealed against dirt and moisture; and all-steel construction for maximum strength.

Reading Multiple Gear Chain Hoists are available in ratings from ½ ton to 20 tons for hoisting jobs that require speed and accuracy. For full information and prices write for price and dimension data sheet.

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The next eye accident in your plant

may cost many times the price of the Goggles that can prevent it

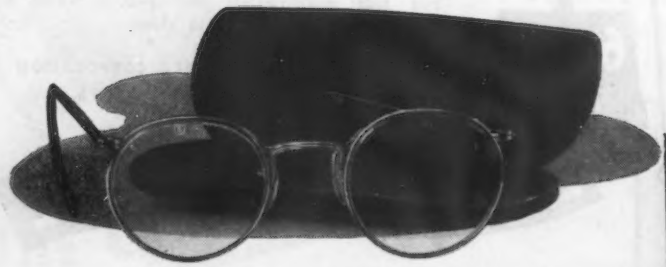

Figure it out for yourself—

The National Safety Council estimates that the average eye accident cost per injured man is $328.00—and this includes only the actual dollars and cents which can be set down in black and white.

The "hidden" costs generally run *four times* this amount for spoilage, idle machinery and lost production.

And when you consider that for about 75¢ per eye, AO Safety Goggles will protect a worker's vision . . . help him turn out more work . . . it becomes evident that furnishing AO Goggles for workers is an effective way to cut costs as well as provide protection.

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